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By-catch of Yellowtail in the American Plaice Fishery in NAFO Divisions 3L, 3N, and 3O

by

W. B. Brodie
Fisheries Research Branch
Department of Fisheries and Oceans
P. O. Box 5667
St. John's, Newfoundland
A1C 5X1

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Abstract

By-catches of yellowtail in the American plaice fishery in NAFO Div. 3L, 3N, and 3O were examined. Information from the commercial fishery from 1974-81 and from research vessel surveys, 1971-82 was used to categorize by-catch rates by area, depth and month. Possible effects of by-catch regulations on catches were discussed and some alternatives to regulations were proposed. It was concluded from the analysis that the by-catch of yellowtail in the plaice fishery in Div. 3LNO has become less of a problem in recent years.

Résumé

Nous avons analysé les prises accidentelles de limande à queue jaune dans la pêcherie de plie canadienne dans les div. 3L, 3N et 3Ø de l'OPANO. Les données sur la pêche commerciale de 1974 à 1981 et celles des relevés par navires de recherche de 1971 à 1982 ont servi à classer les prises accidentelles par région, par profondeur et par mois. On examine les effets possible d'une réglementation de ces prises et propose certaines mesures alternatives à la réglementation. De cette analyse, nous concluons que le problème des prises accidentelles de limande à queue jaune dans la pêcherie de plie canadienne dans les div. 3LNØ a perdu de son intensité ces dernières années.

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Materials and Methods

Catch data from three sources were analyzed:

1. Canadian commercial trawler logbooks. These are kept on a trip by trip basis and the resulting information on area fished, time fished, catch weight (estimated) by species, etc. is broken into segments of 1/10 trip, corresponding roughly to 1 day. These are summed to give the totals by gear, month, NAFO Division, etc. The data used in this paper were taken from the fishery by Canadian trawlers in NAFO Div. 3L, 3N, and 3O, from 1974 to 1981. Catches of American plaice and yellowtail were examined from the main species[1] fisheries for these two species. Tables 2-11 give breakdowns of the catches and corresponding by-catch rates (Brown et al. 1973) by year, month, and Division. Figures 1-6 show the catch breakdowns, and the by-catch rates of yellowtail in the main species American plaice fishery (Brodie 1981) are shown in Fig. 7-9. Nominal catches and TAC's of American plaice and yellowtail in NAFO Div. 3LNO are given in Table 1 (Brodie and Pitt, 1982a, b). Catch per unit effort from Canadian (Newfoundland) trawlers by month, for American plaice as main species and yellowtail as main species are shown in Fig. 10 and 11 and Fig. 12 and 13 respectively.

2. Observers based on Canadian TC 5 trawlers in NAFO Div. 3LNO. Data were available from the observer program from 1979-81. Information used here came from actual observed sets directed at American plaice. Tables 12-14 show, by Division and month, catches of American plaice and yellowtail during the period 1979-81, as well as corresponding catch rates of American plaice and the by-catch rate of yellowtail.[2]

3. Research vessel surveys. Successful sets from stratified random surveys conducted by the A. T. CAMERON in NAFO Div. 3L, 3N, and 3O, from 1971-82 were examined. Sets containing American plaice or yellowtail or both were categorized according to the ratio of the two species in the catch. The categories are defined as follows:

    1. Ratio of yellowtail to plaice in a set = 0.
    2. Ratio of yellowtail to plaice is >0 and ≤0.1.
    3. Ratio of yellowtail to plaice is >0.1 and ≤0.5.
    4. Ratio of yellowtail to plaice is >0.5 and ≤1.0.
    5. Ratio of yellowtail to plaice is >1.0.
    6. Ratio of yellowtail to plaice is undefined (no plaice in set).

Catches of American plaice and yellowtail were examined by unit area - a rectangle formed by a degree of longtitude and one-half degree of latitude (Fig. 14). All sets which met the criteria outlined above are shown, by unit area, in Fig. 15. Tables 15-17 give a breakdown of the categorized research sets by NAFO Division and Table 18 shows the average depth by category for the

[1]Main species label is given to the predominant species (by weight) in the catch.

[2]In the case of observer data, the term "directed species" is given to the species that the captain of the vessel says he is fishing for. It is not always the predominant species in the catch.

selected sets in each division. By combining the areas with high yellowtail abundance into six groups (Fig. 16), a year by year comparison of the research sets, by category, was possible (Tables 19-24). The combined groups of unit areas are defined as follows:

Group NP - N32, N33, P31, P32, P33.
Group Q - Q30-Q34 inclusive.
Group R - R28-R36 inclusive.
Group S - S28-S36 inclusive.
Group T - T28-T36 inclusive.
Group U - U29-U31 inclusive.

Group S was selected for a comparison of catch compositions between each of the years in the period 1971-82. Figure 17 shows the percentage of sets, by category, for each year.

Because the majority of sets in the research data base came from annual spring groundfish surveys by the A. T. CAMERON (April, May, and June), no attempt was made to analyze the data on a seasonal basis.

Results

Catches

The fisheries for American plaice and yellowtail in NAFO Div. 3LNO have been conducted almost exclusively by Canadian vessels since 1976. The first TAC's for these stocks were introduced in 1973 at levels of 60,000 t for plaice and 50,000 t for yellowtail. Table 1 shows that the catches and TAC's for plaice have remained relatively constant around 50,000 t but that the catches and TAC's for yellowtail have fluctuated somewhat from year to year, with recent catches of yellowtail averaging around 15,000 t. A breakdown of the Canadian trawler catches by NAFO Division revealed that an increasing proportion of the plaice catch has been coming from Div. 3L (Fig. 1) but that the yellowtail catches (proportionally by division) have remained relatively stable (Fig. 2). Figures 3 and 4 show that peak catches of plaice in Div. 3LNO have occurred in the spring in recent years as opposed to the fall in earlier years while Fig. 5 and 6 show that the peak catches of yellowtail have usually been in the fall months, although there were significant catches, in most years up to 1979, in the spring.

Catch rates

Examination of catch rates of American plaice from the log data (Fig. 10-11) and the observer data (Tables 13-14) revealed that the best consistent catch per unit effort, on a monthly basis, occurred in NAFO Div. 3L. Figure 11 showed that early-year catch rates in Div. 3L have been particularly good in 1980 and 1981. Figures 10-11 also showed that the catch rates in all three Divisions tended to be closer together over the last 4-6 months of the year. Plots of yellowtail catch rates (Fig. 12-13) show more month to month variation

but the figures revealed that the highest catch per unit effort was in Div. 3N. Also noticeable from these graphs was the lack of directed effort for yellowtail in certain months - in particular, January-March, and the presence of consistently high peaks in October or November of every year, 1976-81. It should be noted that the catch rates for both American plaice and yellowtail used here were from Canadian (N), OT, main species plaice and yellowtail fisheries only.

By-catch rates

Analysis of the by-catch of yellowtail in the main species plaice fishery, by Canadian trawlers, during the period 1974-81, revealed that the by-catch rate has dropped slightly in Div. 3L, remained relatively constant in Div. 3N, and fallen significantly in Div. 3Ø, with the result that the overall by-catch rate in Div. 3LNO has fallen steadily from 0.1580 in 1977 to 0.0787 in 1981 (Table 2, Fig. 7). Figure 7 also showed that the by-catch rate in Div. 3N has been considerably higher than in the other two Divisions since 1977. Data from the observer program, 1980-81, (Tables 13-14) also indicated that the yellowtail by-catch rates were higher in Div. 3N, although the data shows that the observed rate in Div. 3N in 1981 was considerably higher than the corresponding figure for 1980. Tables 4-11 give monthly breakdowns, by NAFO Division, of the by-catch rates in both the main species plaice and yellowtail fisheries for the period 1974-81. Figures 8 and 9 show the yellowtail by-catch rates, by month, for Div. 3N only for the same period. These figures showed, for most years, that higher by-catches of yellowtail occurred in the spring and summer.

By-catch rates of American plaice in the main species yellowtail fishery are given in Tables 2-11 and showed, as would be expected, higher by-catch rates in Div. 3L but considerably higher catches in Div. 3N, where the vast majority of effort for yellowtail was directed.

Research vessel data

Six categories were created so that research sets could be classified according to the ratio of yellowtail to plaice in the set. Summaries, by unit area, of the categorized stratified random sets made by the A. T. CAMERON between 1971 and 1982 (Tables 15-17, Fig. 15), revealed considerably fewer "by-catch sets" in Div. 3L than in the other two divisions, with Div. 3N having more sets with significant yellowtail "by-catch" than Div. 3Ø. Analysis of these sets, by depth (Table 18), indicated, as would be expected, that yellowtail catches in relation to plaice catches increased as the average depth decreased. To encompass the major areas where yellowtail abundance appeared to be highest, unit areas were combined to form six groups (Fig. 16). Analysis of the sets in these groups on a year to year basis (Tables 19-24) showed minor differences in the composition by category, but most of these were attributed to changes in average depth of the sets between years. Figure 17 compares the set composition, by category, from 1971-82 for group S (Fig. 16). Although there are some variations from year to year, it is obvious that sets in category five comprise the majority each year.

Discussion

It would appear, from this analysis, that the problem of yellowtail by-catch in the American plaice fishery has diminished over the last 2-3 years. Yellowtail TAC's in Div. 3LNO were not taken in 1980, 1981 and 1982, and preliminary indications show a considerable shortfall for 1983 as well. By-catch rates of yellowtail in the main species plaice fishery have dropped steadily since 1977, with no appreciable drop in the catch rates in the main species yellowtail fishery - in fact, CPUE virtually doubled during the period 1976-80. The research vessel data shows no startling changes in the ratio of yellowtail to plaice in the sets over the past several years. There have been no major changes to the by-catch regulations which would have affected greatly the operations of the commercial fleet, although frequent changes to the trip allowance for yellowtail have been made in some years, based on management plans. The most obvious reason for the lower catches and by-catches of yellowtail in the past 2 or 3 years is the significantly higher percentage of the American plaice TAC being taken in NAFO Div. 3L, where catch rates in 1980 and 1981 were somewhat higher than in previous years. By-catches of yellowtail were also shown to be much lower in Div. 3L than in the other two Divisions in question, particularly Div. 3N. Another factor to be considered is an apparent increase in preference by the industry to catch American plaice instead of yellowtail because of lower processing costs, less wastage, etc. After analyzing all these factors, it appears that the by-catch of yellowtail in the Div. 3LNO American plaice fishery has not been a major factor over the last 3 years and that the current by-catch regulations do not appear to be overly restrictive.

There are, of course, alternatives to imposing a straight percentage-type of regulation to control by-catch of yellowtail in Div. 3LNO. Some of these, with a few of their advantages and disadvantages, are listed below:

1. Introduction of a closed area. When the total catch of yellowtail in a year approached some critical percentage of the TAC (e.g. 80%), the area of highest yellowtail abundance would be temporarily closed to vessels. Such a measure would eliminate the need for trip limits on yellowtail. The obvious disadvantages would be the potential loss in yield of other species from the closed area, and possible difficulties in patrolling such an area. If a closed area was required, current catch rates and research vessel surveys could be used to identify the most suitable area.

2. Management of American plaice and yellowtail at one TAC level. This measure would eliminate the need to monitor two TAC's and would not require any control over by-catch. However, the disadvantages of such a system would be numerous; the most obvious of which is the possible over-exploitation of one species. Until a careful multi-species management scheme could be created, it is doubtful if such a measure would be feasible.

3. Management of American plaice at the $F_{0.1}$ level and the removal of yellowtail as a by-catch only. Closely related to 2) above, this proposal also would eliminate the need to monitor by-catch rates. However, the low

by-catches of yellowtail in the plaice fishery in the past several years would result in the yellowtail catch under such a scheme being considerably less than the current TAC, as indicated in the following table:

Am. plaice TAC, Div. 3LNO, 1983:	55,000 t
By-catch ratio, yellowtail in main species plaice fishery, 1981:	0.0787
Calculated yellowtail yield in 1983 (projected, as by-catch):	4,329 t
Yellowtail TAC, Div. 3LNO, 1983:	19,000 t
Theoretical loss in yellowtail yield:	14,671 t

Such are some of the options to by-catch regulations. If such management ideas were introduced, undoubtedly there would be changes in the way the fishery would have to operate. These changes, and their possible effects on catch rates, by-catch rates, fishing patterns, etc., are almost impossible to predict.

Conclusions

All available information on by-catch of yellowtail in the American plaice fishery in NAFO Div. 3LNO points to the conclusion that the by-catch problem is not as severe as it was in past years. Significant reductions in catches and by-catch rates of yellowtail in recent years without a corresponding tightening of by-catch regulations suggest that yellowtail is being avoided in favour of American plaice. Increased catch rates of American plaice in NAFO Div. 3L have made this a more lucrative fishery in the past 2 years and corresponding by-catches of yellowtail were low. A significant increase in effort in NAFO Div. 3N would see the by-catch issue in these fisheries become more prominent again.

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Table 1. Nominal catches (t), and TAC's for American plaice and yellowtail in NAFO Divisions 3L, 3N, and 3O, 1974-81. Figures in parentheses represent percentages of total catch taken in each division.

Year	Species	3L	3N	3O	Total[a]	TAC
1974	Am. plaice	16,609 (35.9)	21,118 (45.6)	8,561 (18.5)	46,297	60,000
	Yellowtail	1,544 (6.5)	19,329 (79.5)	3,440 (14.1)	24,313	40,000
1975	Am. plaice	15,171 (35.1)	21,308 (49.3)	6,742 (15.6)	43,221	60,000
	Yellowtail	2,638 (11.5)	16,156 (70.6)	4,100 (17.9)	22,894	35,000
1976	Am. plaice	25,112 (48.5)	18,623 (35.9)	8,080 (15.6)	51,825	47,000
	Yellowtail	516 (6.4)	5,023 (62.3)	2,518 (31.3)	8,057	9,000
1977	Am. plaice	23,763 (54.0)	16,543 (37.6)	3,675 (8.4)	43,981	47,000
	Yellowtail	2,651 (22.8)	7,381 (63.4)	1,606 (13.8)	11,638	12,000
1978	Am. plaice	30,145 (60.3)	13,443 (26.9)	6,440 (12.9)	50,028	47,000
	Yellowtail	2,547 (16.5)	11,079 (71.6)	1,840 (11.9)	15,466	15,000
1979	Am. plaice	28,708 (59.1)	14,712 (30.3)	5,149 (10.6)	48,569	47,000
	Yellowtail	2,595 (14.1)	14,556 (79.3)	1,200 (6.5)	18,351	18,000
1980	Am. plaice	31,728 (64.6)	15,107 (30.8)	2,250 (4.6)	49,085	47,000
	Yellowtail	1,898 (15.3)	9,805 (79.2)	674 (5.4)	12,377	18,000
1981[b]	Am. plaice	37,256 (75.5)	9,579 (19.4)	2,518 (5.1)	49,353	55,000
	Yellowtail	2,352 (16.2)	11,558 (79.8)	572 (3.9)	14,482	21,000

[a]Totals for some years include catches attributed to Divisions 3LNO which are not broken down by division.

[b]Provisional.

Table 2. Catches (t) by Canadian trawlers, 1974-81, NAFO Divisions 3LNO, main species fisheries for American plaice and yellowtail. Figures in parentheses represent the ratio of the by-catch species to the main species.

	Main species fishery			
	American plaice		Yellowtail	
	Catches			
Year	American plaice	Yellowtail	American plaice	Yellowtail
1974	28,263	2,790 (0.0987)	4,562 (0.3211)	14,208
1975	26,136	4,953 (0.1895)	4,977 (0.3720)	13,380
1976	40,852	2,763 (0.0676)	1,928 (0.3946)	4,886
1977	34,924	5,517 (0.1580)	2,194 (0.4227)	5,191
1978	39,175	5,213 (0.1331)	3,050 (0.3235)	9,428
1979	34,535	3,699 (0.1071)	3,987 (0.3012)	13,238
1980	36,346	3,421 (0.0941)	2,288 (0.2912)	7,858
1981[a]	35,927	2,827 (0.0787)	3,308 (0.3174)	10,422

[a]provisional

Table 3. Breakdown of catches (t) by Canadian trawlers, 1974-81, by division, for main species fisheries for American plaice and yellowtail.

Year	NAFO Division	Main species fishery: American plaice — Catches: American plaice	Main species fishery: American plaice — Catches: Yellowtail	Main species fishery: Yellowtail — Catches: American plaice	Main species fishery: Yellowtail — Catches: Yellowtail
1974	3L	11,476	706 (0.0615)	219 (0.5489)	399
	3N	9,609	1,600 (0.1665)	4,022 (0.3056)	13,162
	3O	7,178	484 (0.0674)	321 (0.4961)	647
1975	3L	10,548	984 (0.0933)	792 (0.6018)	1,316
	3N	12,960	2,963 (0.2286)	3,269 (0.3170)	10,311
	3O	2,628	1,006 (0.3828)	916 (0.5225)	1,753
1976	3L	20,132	299 (0.0149)	62 (0.5794)	107
	3N	15,569	1,250 (0.0803)	1,305 (0.3553)	3,673
	3O	5,151	1,214 (0.2357)	561 (0.5072)	1,106
1977	3L	18,228	1,488 (0.0816)	451 (0.5073)	889
	3N	14,076	3,395 (0.2412)	1,356 (0.3750)	3,616
	3O	2,620	634 (0.2420)	387 (0.5641)	686
1978	3L	23,946	1,803 (0.0753)	370 (0.6218)	595
	3N	10,056	2,624 (0.2609)	2,269 (0.2849)	7,964
	3O	5,173	786 (0.1519)	411 (0.4730)	869
1979	3L	20,600	1,268 (0.0616)	465 (0.5339)	871
	3N	10,333	2,128 (0.2059)	3,320 (0.2801)	11,853
	3O	3,602	303 (0.0841)	202 (0.3930)	514
1980	3L	22,806	956 (0.0419)	291 (0.5150)	565
	3N	12,085	2,374 (0.1964)	1,848 (0.2686)	6,879
	3O	1,455	91 (0.0625)	149 (0.3599)	414
1981[a]	3L	28,485	1,245 (0.0437)	384 (0.5630)	682
	3N	6,089	1,437 (0.2360)	2,843 (0.2972)	9,566
	3O	1,353	145 (0.1072)	81 (0.4655)	174

[a]provisional

Table 4. Breakdown of catches (t) by Canadian trawlers, 1974, by division and month for main species fisheries for American plaice and yellowtail.

		Main species fishery					
		American plaice			Yellowtail		
Month	NAFO Div.	Am. plaice catch	Yellowtail catch	Yellowtail by-catch ratio	Am. plaice catch	Yellowtail catch	Am. plaice by-catch ratio
	3L	370	0	0.0000	0	0	-
Jan.	3N	626	5	0.0080	2	12	0.1667
	3Ø	1811	1	0.0006	0	0	-
	3LNØ	2807	6	0.0021	2	12	0.1667
	3L	969	130	0.1342	1	1	1.0000
Feb.	3N	1447	224	0.1548	0	2	0.0000
	3Ø	1296	31	0.0239	0	0	-
	3LNØ	3712	385	0.1037	1	3	0.3333
	3L	1146	18	0.0157	7	9	0.7778
March	3N	308	12	0.0390	0	0	-
	3Ø	1341	5	0.0037	0	0	-
	3LNØ	2795	35	0.0125	7	9	0.7778
	3L	403	6	0.0149	2	3	0.6667
April	3N	14	0	0.0000	159	471	0.3376
	3Ø	1169	93	0.0796	56	100	0.5600
	3LNØ	1586	99	0.0624	217	574	0.3780
	3L	683	13	0.0190	31	111	0.2793
May	3N	96	46	0.4792	747	3094	0.2414
	3Ø	373	117	0.3137	64	98	0.6531
	3LNØ	1152	176	0.1528	842	3303	0.2549
	3L	753	118	0.1567	55	87	0.6322
June	3N	220	71	0.3227	891	1769	0.5037
	3Ø	138	25	0.1812	96	243	0.3951
	3LNØ	1111	214	0.1926	1042	2099	0.4964
	3L	1557	277	0.1779	36	75	0.4800
July	3N	911	584	0.6411	1037	1587	0.6534
	3Ø	321	85	0.2648	100	197	0.5076
	3LNØ	2789	946	0.3392	1173	1859	0.6310
	3L	267	78	0.2921	81	98	0.8265
Aug.	3N	255	95	0.3725	394	967	0.4074
	3Ø	220	98	0.4455	0	0	-
	3LNØ	742	271	0.3652	475	1065	0.4460

Table 4. (Cont'd.)

		Main species fishery					
		American plaice			Yellowtail		
Month	NAFO Div.	Am. plaice catch	Yellowtail catch	Yellowtail by-catch ratio	Am. plaice catch	Yellowtail catch	Am. plaice by-catch ratio
	3L	645	4	0.0062	2	5	0.4000
Sept.	3N	816	61	0.0748	152	1346	0.1129
	3Ø	332	17	0.0512	0	0	-
	3LNØ	1793	82	0.0457	154	1351	0.1140
	3L	2406	58	0.0241	0	1	0.0000
Oct.	3N	1356	156	0.1150	209	1110	0.1883
	3Ø	21	0	0.0000	1	4	0.2500
	3LNØ	3783	214	0.0566	210	1115	0.1883
	3L	1153	4	0.0035	4	9	0.4444
Nov.	3N	1331	242	0.1818	394	2704	0.1457
	3Ø	81	10	0.1235	4	5	0.8000
	3LNØ	2565	256	0.0998	402	2718	0.1479
	3L	1124	0	0.0000	0	0	-
Dec.	3N	2229	104	0.0467	37	100	0.3700
	3Ø	75	2	0.0267	0	0	-
	3LNØ	3428	106	0.0309	37	100	0.3700

Table 5. Breakdown of catches (t) by Canadian trawlers, 1975, by division and month for main species fisheries for American plaice and yellowtail.

		Main species fishery					
		American plaice			Yellowtail		
Month	NAFO Div.	Am. plaice catch	Yellowtail catch	Yellowtail by-catch ratio	Am. plaice catch	Yellowtail catch	Am. plaice by-catch ratio
Jan.	3L	0	0	-	0	0	-
	3N	0	0	-	0	0	-
	3Ø	0	0	-	0	0	-
	3LNØ	0	0	-	0	0	-
Feb.	3L	0	0	-	0	0	-
	3N	0	0	-	0	0	-
	3Ø	6	0	0.0000	0	0	-
	3LNØ	6	0	0.0000	0	0	-
March	3L	0	0	-	0	0	-
	3N	0	0	-	0	0	-
	3Ø	12	4	0.3333	0	0	-
	3LNØ	12	4	0.3333	0	0	-
April	3L	150	68	0.4533	95	176	0.5398
	3N	461	128	0.2777	340	1012	0.3360
	3Ø	319	12	0.0376	32	117	0.2735
	3LNØ	930	208	0.2237	467	1305	0.3579
May	3L	287	51	0.1777	56	85	0.6588
	3N	165	61	0.3697	431	1163	0.3706
	3Ø	361	180	0.4986	94	197	0.4772
	3LNØ	813	292	0.3592	581	1445	0.4021
June	3L	629	173	0.2750	157	214	0.7336
	3N	605	310	0.5124	654	1127	0.5803
	3Ø	306	212	0.6928	427	746	0.5724
	3LNØ	1540	695	0.4513	1238	2087	0.5932
July	3L	1048	451	0.4303	393	614	0.6401
	3N	2212	797	0.3603	193	300	0.6433
	3Ø	447	254	0.5682	110	174	0.6322
	3LNØ	3707	1502	0.4052	696	1088	0.6397
Aug.	3L	1443	141	0.0977	66	112	0.5893
	3N	2156	694	0.3219	340	789	0.4309
	3Ø	461	171	0.3709	111	178	0.6236
	3LNØ	4060	1006	0.2478	517	1079	0.4791

Table 5. (Cont'd.)

		Main species fishery					
		American plaice			Yellowtail		
Month	NAFO Div.	Am. plaice catch	Yellowtail catch	Yellowtail by-catch ratio	Am. plaice catch	Yellowtail catch	Am. plaice by-catch ratio
Sept.	3L	2708	52	0.0192	17	89	0.1910
	3N	1266	254	0.2006	551	2409	0.2287
	3Ø	132	18	0.1364	30	95	0.3158
	3LNØ	4106	324	0.0789	598	2593	0.2306
Oct.	3L	1042	36	0.0345	5	6	0.8333
	3N	1631	179	0.1097	381	2075	0.1836
	3Ø	202	122	0.6040	21	67	0.3134
	3LNØ	2875	337	0.1172	407	2148	0.1895
Nov.	3L	1856	9	0.0048	0	0	-
	3N	1888	249	0.1319	266	972	0.2737
	3Ø	239	30	0.1255	84	127	0.6614
	3LNØ	3983	288	0.0723	350	1099	0.3185
Dec.	3L	1385	3	0.0022	3	20	0.1500
	3N	2576	291	0.1130	113	464	0.2435
	3Ø	143	3	0.0210	7	52	0.1346
	3LNØ	4104	297	0.0724	123	536	0.2295

Table 6. Breakdown of catches (t) by Canadian trawlers, 1976, by division and month for main species fisheries for American plaice and yellowtail.

		Main species fishery					
		American plaice			Yellowtail		
Month	NAFO Div.	Am. plaice catch	Yellowtail catch	Yellowtail by-catch ratio	Am. plaice catch	Yellowtail catch	Am. plaice by-catch ratio
	3L	935	1	0.0011	0	0	-
Jan.	3N	1504	62	0.0412	26	116	0.2241
	3Ø	782	14	0.0179	0	0	-
	3LNØ	3221	77	0.0239	26	116	0.2241
	3L	852	2	0.0023	0	0	-
Feb.	3N	970	26	0.0268	12	68	0.1765
	3Ø	545	28	0.0514	0	0	-
	3LNØ	2367	56	0.0237	12	68	0.1765
	3L	1276	19	0.0149	4	8	0.5000
March	3N	74	3	0.0405	107	286	0.3741
	3Ø	121	3	0.0248	48	154	0.3117
	3LNØ	1471	25	0.0170	159	448	0.3549
	3L	780	2	0.0026	3	6	0.5000
April	3N	110	23	0.2091	478	1712	0.2792
	3Ø	113	1	0.0088	64	193	0.3316
	3LNØ	1003	26	0.0259	545	1911	0.2852
	3L	882	5	0.0057	31	51	0.6078
May	3N	352	101	0.2869	557	1209	0.4607
	3Ø	1177	715	0.6075	338	542	0.6236
	3LNØ	2411	821	0.3405	926	1802	0.5139
	3L	2456	43	0.0175	3	3	1.0000
June	3N	1738	75	0.0432	28	94	0.2979
	3Ø	408	74	0.1814	34	78	0.4359
	3LNØ	4602	192	0.0417	65	175	0.3714
	3L	1987	132	0.0664	7	13	0.5385
July	3N	2140	146	0.0682	6	17	0.3529
	3Ø	481	64	0.1331	10	24	0.4167
	3LNØ	4608	342	0.0742	23	54	0.4259
	3L	1674	53	0.0317	0	0	-
Aug.	3N	2772	287	0.1035	0	0	-
	3Ø	532	145	0.2726	28	42	0.6667
	3LNØ	4978	485	0.0974	28	42	0.6667

Table 6. (Cont'd.)

		Main species fishery					
		American plaice			Yellowtail		
Month	NAFO Div.	Am. plaice catch	Yellowtail catch	Yellowtail by-catch ratio	Am. plaice catch	Yellowtail catch	Am. plaice by-catch ratio
Sept.	3L	3667	29	0.0079	1	1	1.0000
	3N	2487	283	0.1138	40	75	0.5333
	3Ø	419	98	0.2339	7	11	0.6364
	3LNØ	6573	410	0.0624	48	87	0.5517
Oct.	3L	2882	6	0.0021	13	25	0.5200
	3N	1070	116	0.1084	35	60	0.5833
	3Ø	317	56	0.1767	21	39	0.5385
	3LNØ	4269	178	0.0417	69	124	0.5565
Nov.	3L	1782	7	0.0039	0	0	-
	3N	1471	112	0.0761	4	15	0.2667
	3Ø	180	14	0.0778	11	17	0.6471
	3LNØ	3433	133	0.0387	15	32	0.4688
Dec.	3L	959	0	0.0000	0	0	-
	3N	881	16	0.0182	12	21	0.5714
	3Ø	76	2	0.0263	0	6	0.0000
	3LNØ	1916	18	0.0094	12	27	0.4444

Table 7. Breakdown of catches (t) by Canadian trawlers, 1977, by division and month for main species fisheries for American plaice and yellowtail.

		Main species fishery					
		American plaice			Yellowtail		
Month	NAFO Div.	Am. plaice catch	Yellowtail catch	Yellowtail by-catch ratio	Am. plaice catch	Yellowtail catch	Am. plaice by-catch ratio
	3L	0	0	-	0	0	-
Jan.	3N	0	0	-	0	0	-
	3Ø	0	0	-	0	0	-
	3LNØ	0	0	-	0	0	-
	3L	1013	0	0.0000	0	21	0.0000
Feb.	3N	720	8	0.0111	0	0	-
	3Ø	202	3	0.0149	0	0	-
	3LNØ	1935	11	0.0057	0	21	0.0000
	3L	123	13	0.1057	0	0	-
March	3N	207	37	0.1787	9	21	0.4286
	3Ø	52	0	0.0000	0	0	-
	3LNØ	382	50	0.1309	9	21	0.4286
	3L	119	1	0.0084	7	8	0.8750
April	3N	177	30	0.1695	4	11	0.3636
	3Ø	31	3	0.0968	12	40	0.3000
	3LNØ	327	34	0.1040	23	59	0.3898
	3L	1735	69	0.0398	20	44	0.4545
May	3N	578	211	0.3651	341	663	0.5143
	3Ø	158	69	0.4367	53	132	0.4015
	3LNØ	2471	349	0.1412	414	839	0.4934
	3L	2566	284	0.1107	186	345	0.5391
June	3N	2117	583	0.2754	117	217	0.5392
	3Ø	300	143	0.4767	126	190	0.6632
	3LNØ	4983	1010	0.2027	429	752	0.5705
	3L	2169	368	0.1697	108	248	0.4355
July	3N	1902	490	0.2576	282	647	0.4359
	3Ø	298	66	0.2215	135	213	0.6338
	3LNØ	4369	924	0.2115	525	1108	0.4738
	3L	2421	566	0.2338	127	217	0.5853
Aug.	3N	2100	676	0.3219	209	423	0.4941
	3Ø	470	171	0.3638	43	57	0.7544
	3LNØ	4991	1413	0.2831	379	697	0.5438

Table 7. (Cont'd.)

		Main species fishery					
		American plaice			Yellowtail		
Month	NAFO Div.	Am. plaice catch	Yellowtail catch	Yellowtail by-catch ratio	Am. plaice catch	Yellowtail catch	Am. plaice by-catch ratio
	3L	2180	120	0.0550	0	0	-
Sept.	3N	1605	354	0.2206	54	150	0.3600
	3Ø	359	88	0.2451	8	9	0.8889
	3LNØ	4144	562	0.1356	62	159	0.3899
	3L	2054	54	0.0263	2	4	0.5000
Oct.	3N	1644	283	0.1721	15	37	0.4054
	3Ø	328	28	0.0854	0	0	-
	3LNØ	4026	365	0.0907	17	41	0.4146
	3L	2273	13	0.0057	1	2	0.5000
Nov.	3N	1588	467	0.2941	250	1122	0.2228
	3Ø	336	62	0.1845	2	24	0.0833
	3LNØ	4197	542	0.1291	253	1148	0.2204
	3L	1575	0	0.0000	0	0	-
Dec.	3N	1438	256	0.1780	75	325	0.2308
	3Ø	86	1	0.0116	8	21	0.3810
	3LNØ	3099	257	0.0829	83	346	0.2399

Table 8. Breakdown of catches (t) by Canadian trawlers, 1978, by division and month for main species fisheries for American plaice and yellowtail.

		Main species fishery					
		American plaice			Yellowtail		
Month	NAFO Div.	Am. plaice catch	Yellowtail catch	Yellowtail by-catch ratio	Am. plaice catch	Yellowtail catch	Am. plaice by-catch ratio
	3L	137	1	0.0073	0	0	-
Jan.	3N	780	147	0.1885	18	72	0.2500
	3Ø	271	3	0.0111	1	3	0.3333
	3LNØ	1188	151	0.1271	19	75	0.2533
	3L	136	0	0.0000	0	2	0.0000
Feb.	3N	247	29	0.1174	19	26	0.7308
	3Ø	416	7	0.0168	0	0	-
	3LNØ	799	36	0.0451	19	28	0.6786
	3L	121	0	0.0000	0	0	-
March	3N	407	50	0.1229	23	56	0.4107
	3Ø	183	3	0.0164	7	20	0.3500
	3LNØ	711	53	0.0745	30	76	0.3947
	3L	163	3	0.0184	1	2	0.5000
April	3N	401	55	0.1372	108	443	0.2438
	3Ø	184	23	0.1250	33	99	0.3333
	3LNØ	748	81	0.1083	142	544	0.2610
	3L	1855	148	0.0798	17	27	0.6296
May	3N	190	14	0.0737	109	353	0.3088
	3Ø	835	371	0.4443	271	492	0.5508
	3LNØ	2880	533	0.1851	397	872	0.4553
	3L	4562	956	0.2096	140	207	0.6763
June	3N	1085	311	0.2866	255	438	0.5822
	3Ø	348	67	0.1925	36	52	0.6923
	3LNØ	5995	1334	0.2225	431	697	0.6184
	3L	4371	329	0.0753	40	77	0.5195
July	3N	1084	382	0.3524	162	295	0.5492
	3Ø	256	60	0.2344	27	47	0.5745
	3LNØ	5711	771	0.1350	229	419	0.5465
	3L	4010	260	0.0648	95	163	0.5828
Aug.	3N	1714	557	0.3250	201	490	0.4102
	3Ø	282	37	0.1312	11	44	0.2500
	3LNØ	6006	854	0.1422	307	697	0.4405

Table 8. (Cont'd.)

		Main species fishery					
		American plaice			Yellowtail		
Month	NAFO Div.	Am. plaice catch	Yellowtail catch	Yellowtail by-catch ratio	Am. plaice catch	Yellowtail catch	Am. plaice by-catch ratio
	3L	2950	93	0.0315	62	77	0.8052
Sept.	3N	860	257	0.2988	193	741	0.2605
	3Ø	315	48	0.1524	0	0	-
	3LNØ	4125	398	0.0965	255	818	0.3117
	3L	2068	10	0.0048	15	40	0.3750
Oct.	3N	1503	544	0.3619	495	2518	0.1966
	3Ø	849	61	0.0718	13	38	0.3421
	3LNØ	4420	615	0.1391	523	2596	0.2015
	3L	1046	0	0.0000	0	0	-
Nov.	3N	1017	185	0.1819	579	2074	0.2792
	3Ø	836	79	0.0945	10	25	0.4000
	3LNØ	2899	264	0.0911	589	2099	0.2806
	3L	2527	3	0.0012	0	0	-
Dec.	3N	768	93	0.1211	107	458	0.2336
	3Ø	398	27	0.0678	2	49	0.0408
	3LNØ	3693	123	0.0333	109	507	0.2150

Table 9. Breakdown of catches (t) by Canadian trawlers, 1979, by division and month for main species fisheries for American plaice and yellowtail.

		Main species fishery					
		American plaice			Yellowtail		
Month	NAFO Div.	Am. plaice catch	Yellowtail catch	Yellowtail by-catch ratio	Am. plaice catch	Yellowtail catch	Am. plaice by-catch ratio
	3L	1996	0	0.0000	0	0	-
Jan.	3N	205	3	0.0146	1	8	0.1250
	3Ø	113	1	0.0088	0	0	-
	3LNØ	2314	4	0.0017	1	8	0.1250
	3L	541	0	0.0000	0	0	-
Feb.	3N	261	13	0.0498	4	14	0.2857
	3Ø	1	0	0.0000	0	0	-
	3LNØ	803	13	0.0162	4	14	0.2857
	3L	1328	101	0.0761	37	64	0.5781
March	3N	70	5	0.0714	28	104	0.2692
	3Ø	5	0	0.0000	0	0	-
	3LNØ	1403	106	0.0756	65	168	0.3869
	3L	1154	99	0.0858	48	74	0.6486
April	3N	217	75	0.3456	401	923	0.4345
	3Ø	153	30	0.1961	16	46	0.3478
	3LNØ	1524	204	0.1339	465	1043	0.4458
	3L	1784	348	0.1951	138	262	0.5267
May	3N	378	170	0.4497	376	837	0.4492
	3Ø	132	23	0.1742	85	186	0.4570
	3LNØ	2294	541	0.2358	599	1285	0.4661
	3L	2589	208	0.0803	124	225	0.5511
June	3N	815	283	0.3472	439	1011	0.4342
	3Ø	220	19	0.0864	21	43	0.4884
	3LNØ	3624	510	0.1407	584	1279	0.4566
	3L	3850	226	0.0587	80	155	0.5161
July	3N	1712	342	0.1998	197	529	0.3724
	3Ø	305	24	0.0787	15	27	0.5556
	3LNØ	5867	592	0.1009	292	711	0.4107
	3L	2881	219	0.0760	9	33	0.2727
Aug.	3N	1674	357	0.2133	236	847	0.2786
	3Ø	178	25	0.1404	14	28	0.5000
	3LNØ	4733	601	0.1270	259	908	0.2852

Table 9. (Cont'd.)

		Main species fishery					
		American plaice			Yellowtail		
Month	NAFO Div.	Am. plaice catch	Yellowtail catch	Yellowtail by-catch ratio	Am. plaice catch	Yellowtail catch	Am. plaice by-catch ratio
Sept.	3L	1912	53	0.0277	15	26	0.5769
	3N	1210	312	0.2579	558	1859	0.3002
	3Ø	198	23	0.1162	5	22	0.2273
	3LNØ	3320	388	0.1169	578	1907	0.3031
Oct.	3L	966	13	0.0135	14	30	0.4667
	3N	579	152	0.2625	660	4144	0.1593
	3Ø	186	19	0.1022	27	130	0.2077
	3LNØ	1731	184	0.1063	701	4304	0.1629
Nov.	3L	1062	1	0.0009	0	2	0.0000
	3N	1993	250	0.1254	394	1536	0.2565
	3Ø	1466	76	0.0518	17	30	0.5667
	3LNØ	4521	327	0.0723	411	1568	0.2621
Dec.	3L	537	0	0.0000	0	0	-
	3N	1219	166	0.1362	26	41	0.6341
	3Ø	645	63	0.0977	2	2	1.0000
	3LNØ	2401	229	0.0954	28	43	0.6512

Table 10. Breakdown of catches (t) by Canadian trawlers, 1980, by division and month for main species fisheries for American plaice and yellowtail.

		Main species fishery					
		American plaice			Yellowtail		
Month	NAFO Div.	Am. plaice catch	Yellowtail catch	Yellowtail by-catch ratio	Am. plaice catch	Yellowtail catch	Am. plaice by-catch ratio
	3L	0	0	-	0	0	-
Jan.	3N	0	0	-	0	0	-
	3Ø	0	0	-	0	0	-
	3LNØ	0	0	-	0	0	-
	3L	658	0	0.0000	0	0	-
Feb.	3N	359	0	0.0000	0	0	-
	3Ø	17	0	0.0000	0	0	-
	3LNØ	1034	0	0.0000	0	0	-
	3L	699	0	0.0000	0	0	-
March	3N	481	81	0.1684	32	99	0.3232
	3Ø	402	0	0.0000	0	0	-
	3LNØ	1582	81	0.0512	32	99	0.3232
	3L	302	0	0.0000	0	0	-
April	3N	6	0	0.0000	6	17	0.3529
	3Ø	23	0	0.0000	0	0	-
	3LNØ	331	0	0.0000	6	17	0.3529
	3L	5504	377	0.0685	114	231	0.4935
May	3N	294	84	0.2857	105	236	0.4449
	3Ø	19	0	0.0000	52	163	0.3190
	3LNØ	5817	461	0.0793	271	630	0.4302
	3L	5797	407	0.0702	155	248	0.6250
June	3N	1536	432	0.2813	160	351	0.4558
	3Ø	181	17	0.0939	41	125	0.3280
	3LNØ	7514	856	0.1139	356	724	0.4917
	3L	1650	135	0.0818	20	59	0.3390
July	3N	1234	254	0.2058	73	118	0.6186
	3Ø	67	13	0.1940	5	8	0.6250
	3LNØ	2951	402	0.1362	98	185	0.5297
	3L	453	22	0.0486	2	22	0.0909
Aug.	3N	1342	254	0.1893	15	26	0.5769
	3Ø	7	0	0.0000	1	1	1.0000
	3LNØ	1802	276	0.1532	18	49	0.3673

Table 10. (Cont'd.)

Month	NAFO Div.	Main species fishery: American plaice — Am. plaice catch	Yellowtail catch	Yellowtail by-catch ratio	Main species fishery: Yellowtail — Am. plaice catch	Yellowtail catch	Am. plaice by-catch ratio
	3L	313	10	0.0319	0	0	0.0000
[illegible]	3N	1240	264	0.2129	67	108	0.6204
	3Ø	58	0	0.0000	0	0	0.0000
	3LN	1611	274	0.1701	67	108	0.6204
	3L	2978	4	0.0013	0	5	0.0000
Oct.	3N	2730	513	0.1879	485	2151	0.2255
	3Ø	228	28	0.1228	30	44	0.6818
	3LNØ	5936	545	0.0918	515	2200	0.2341
	3L	1460	0	0.0000	0	0	0.0000
Nov.	3N	1798	360	0.2002	636	3003	0.2118
	3Ø	153	20	0.1307	16	64	0.2500
	3LNØ	3411	380	0.1114	652	3067	0.2126
	3L	2992	1	0.0003	0	0	0.0000
Dec.	3N	1065	132	0.1239	269	770	0.3494
	3Ø	300	13	0.0433	4	9	0.4444
	3LNØ	4357	146	0.0335	273	779	0.3504

Table 11. Breakdown of catches (t) by Canadian trawlers, 1981, by division and month for main species fisheries for American plaice and yellowtail.

		Main species fishery					
		American plaice			Yellowtail		
Month	NAFO Div.	Am. plaice catch	Yellowtail catch	Yellowtail by-catch ratio	Am. plaice catch	Yellowtail catch	Am. plaice by-catch ratio
Jan.	3L	10	0	0.0000	0	0	-
	3N	300	2	0.0067	17	63	0.2698
	3Ø	89	0	0.0000	0	0	-
	3LNØ	399	2	0.0050	17	63	0.2698
Feb.	3L	46	0	0.0000	0	0	-
	3N	15	0	0.0000	8	16	0.5000
	3Ø	6	0	0.0000	0	0	-
	3LNØ	67	0	0.0000	8	16	0.5000
March	3L	2383	2	0.0008	0	0	-
	3N	131	3	0.0229	5	27	0.1852
	3Ø	52	5	0.0962	0	0	-
	3LNØ	2566	10	0.0039	5	27	0.1852
April	3L	5167	101	0.0195	0	0	-
	3N	218	106	0.4862	43	71	0.6056
	3Ø	12	0	0.0000	0	0	-
	3LNØ	5397	207	0.0384	43	71	0.6056
May	3L	6525	671	0.1028	178	272	0.6544
	3N	519	189	0.3642	229	329	0.6960
	3Ø	30	8	0.2667	5	14	0.3571
	3LNØ	7074	868	0.1227	412	615	0.6699
June	3L	4591	189	0.0412	2	8	0.2500
	3N	892	230	0.2578	89	137	0.6496
	3Ø	81	16	0.1975	41	53	0.7736
	3LNØ	5564	435	0.0782	132	198	0.6667
July	3L	1702	145	0.0852	132	225	0.5867
	3N	1377	554	0.4023	926	1709	0.5418
	3Ø	203	49	0.2414	17	54	0.3148
	3LNØ	3282	748	0.2279	1075	1988	0.5407
Aug.	3L	2068	55	0.0266	39	93	0.4194
	3N	729	216	0.2963	923	3354	0.2752
	3Ø	52	6	0.1154	8	18	0.4444
	3LNØ	2849	277	0.0972	970	3465	0.2799

Table 11. (Cont'd.)

Month	NAFO Div.	Main species fishery: American plaice — Am. plaice catch	Yellowtail catch	Yellowtail by-catch ratio	Main species fishery: Yellowtail — Am. plaice catch	Yellowtail catch	Am. plaice by-catch ratio
	3L	2000	57	0.0285	26	65	0.4000
Sept.	3N	667	96	0.1439	394	1589	0.2480
	3Ø	188	1	0.0053	6	29	0.2069
	3LNØ	2855	154	0.0539	426	1683	0.2531
	3L	1678	19	0.0113	3	14	0.2143
Oct.	3N	724	19	0.0262	174	1919	0.0907
	3Ø	275	36	0.1309	0	0	-
	3LNØ	2677	74	0.0276	177	1933	0.0916
	3L	2006	6	0.0030	0	0	-
Nov.	3N	453	16	0.0353	33	347	0.0951
	3Ø	289	13	0.0450	4	6	0.6667
	3LNØ	2748	35	0.0127	37	353	0.1048
	3L	309	0	0.0000	4	5	0.8000
Dec.	3N	64	6	0.0938	2	5	0.4000
	3Ø	76	11	0.1447	0	0	-
	3LNØ	449	17	0.0379	6	10	0.6000

Table 12. Foreign observer program catch and effort summary, Canadian trawlers, TC 5, 1979, NAFO Divisions 3L, 3N, 3O, directed species = American plaice.

NAFO Div.	Month	Observed Am. plaice catch (t)	Observed yellowtail catch (t)	Observed Am. plaice catch rate (t/hr)	Observed yellowtail by-catch rate
3L	Jan.	-	-	-	-
	Feb.	-	-	-	-
	Mar.	-	-	-	-
	Apr.	-	-	-	-
	May	-	-	-	-
	June	-	-	-	-
	July	2.135	-	0.170	-
	Aug.	-	-	-	-
	Sept.	-	-	-	-
	Oct.	-	-	-	-
	Nov.	-	-	-	-
	Dec.	-	-	-	-
	Total	2.135	-	0.170	-
3N	Jan.	-	-	-	-
	Feb.	-	-	-	-
	Mar.	-	-	-	-
	June	-	-	-	-
	July	-	-	-	-
	Aug.	-	-	-	-
	Sept.	-	-	-	-
	Oct.	-	-	-	-
	Nov.	72.395	0.195	0.725	0.0027
	Dec.	24.670	0.350	0.693	0.0142
	Total	97.065	0.545	0.716	0.0056
3Ø	Jan.	-	-	-	-
	Feb.	-	-	-	-
	Mar.	-	-	-	-
	Apr.	-	-	-	-
	May	-	-	-	-
	June	-	-	-	-
	July	-	-	-	-
	Aug.	-	-	-	-
	Sept.	-	-	-	-
	Oct.	-	-	-	-
	Nov.	28.916	0.257	0.328	0.0089
	Dec.	37.715	-	0.509	-
	Total	66.631	0.257	0.411	0.0039

Table 12. (Cont'd.)

NAFO Div.	Month	Observed Am. plaice catch (t)	Observed yellowtail catch (t)	Observed Am. plaice catch rate (t/hr)	Observed yellowtail by-catch rate
3LNØ	Jan.	-	-	-	-
	Feb.	-	-	-	-
	Mar.	-	-	-	-
	Apr.	-	-	-	-
	May	-	-	-	-
	June	-	-	-	-
	July	2.135	-	0.170	-
	Aug.	-	-	-	-
	Sept.	-	-	-	-
	Oct.	-	-	-	-
	Nov.	101.311	0.452	0.539	0.0045
	Dec.	62.385	0.350	0.569	0.0056
	Total	165.830	0.802	0.539	0.0048

Table 13. Foreign observer program catch and effort summary, Canadian trawlers, TC 5, 1980, NAFO Divisions 3L, 3N, 3O, directed species = American plaice.

NAFO Div.	Month	Observed Am. plaice catch (t)	Observed yellowtail catch (t)	Observed Am. plaice catch rate (t/hr)	Observed yellowtail by-catch rate
3L	Jan.	-	-	-	-
	Feb.	143.600	-	1.239	-
	Mar.	92.806	-	0.863	-
	Apr.	-	-	-	-
	May	654.891	32.292	0.674	0.0493
	June	229.833	40.901	0.414	0.1780
	July	44.175	2.900	0.694	0.0656
	Aug.	21.873	3.937	0.558	0.1800
	Sept.	41.671	0.902	0.734	0.0216
	Oct.	31.732	0.020	0.575	0.0006
	Nov.	135.722	-	0.698	-
	Dec.	498.003	-	0.910	-
	Total	1894.306	80.952	0.700	0.0427
3N	Jan.	-	-	-	-
	Feb.	10.000	-	0.615	-
	Mar.	-	-	-	-
	Apr.	-	-	-	-
	May	63.494	16.810	0.544	0.2647
	June	5.628	-	0.200	-
	July	-	-	-	-
	Aug.	163.669	13.469	0.611	0.0823
	Sept.	190.890	19.974	0.654	0.1046
	Oct.	58.863	10.155	0.566	0.1725
	Nov.	-	-	-	-
	Dec.	8.685	1.460	0.315	0.1681
	Total	501.229	61.868	0.589	0.1234
3Ø	Jan.	-	-	-	-
	Feb.	-	-	-	-
	Mar.	2.220	-	0.259	-
	Apr.	-	-	-	-
	May	-	-	-	-
	June	-	-	-	-
	July	2.450	-	0.303	-
	Aug.	0.542	0.227	0.181	0.4188
	Sept.	-	-	-	-
	Oct.	-	-	-	-
	Nov.	-	-	-	-
	Dec.	14.295	-	0.378	-
	Total	19.507	0.227	0.339	0.0116

Table 13. (Cont'd.)

NAFO Div.	Month	Observed Am. plaice catch (t)	Observed yellowtail catch (t)	Observed Am. plaice catch rate (t/hr)	Observed yellowtail by-catch rate
3LNØ	Jan.	-	-	-	-
	Feb.	199.300	-	0.997	-
	Mar.	120.046	-	0.740	-
	Apr.	-	-	-	-
	May	740.865	51.318	0.660	0.0693
	June	253.661	43.251	0.390	0.1705
	July	115.476	2.900	0.774	0.0251
	Aug.	202.140	19.647	0.576	0.0972
	Sept.	256.239	21.195	0.648	0.0827
	Oct.	92.880	11.455	0.550	0.1233
	Nov.	135.722	-	0.698	-
	Dec.	531.396	1.460	0.822	0.0027
	Total	2647.725	151.226	0.656	0.0571

Table 14. Foreign observer program catch and effort summary, Canadian trawlers, TC 5, 1981, NAFO Divisions 3L, 3N, 3O, directed species = American plaice.

NAFO Div.	Month	Observed Am. plaice catch (t)	Observed yellowtail catch (t)	Observed Am. plaice catch rate (t/hr)	Observed yellowtail by-catch rate
3L	Jan.	-	-	-	-
	Feb.	-	-	-	-
	Mar.	287.501	0.016	1.136	0.0001
	Apr.	184.600	1.178	0.473	0.0064
	May	1006.146	25.846	0.646	0.0257
	June	441.974	47.371	0.547	0.1072
	July	290.206	32.812	0.489	0.1131
	Aug.	178.495	-	0.689	-
	Sept.	23.900	-	1.010	
	Oct.	-	-	-	-
	Nov.	-	-	-	-
	Dec.	-	-	-	-
	Total	2412.822	107.223	0.621	0.0444
3N	Jan.	-	-	-	-
	Feb.	-	-	-	-
	Mar.	-	-	-	-
	Apr.	45.091	8.862	0.324	0.1965
	May	22.070	12.680	0.346	0.5745
	June	69.478	25.709	0.436	0.3700
	July	248.877	189.774	0.419	0.7625
	Aug.	17.700	-	0.436	-
	Sept.	156.610	22.824	0.927	0.1457
	Oct.	-	-	-	-
	Nov.	-	-	-	-
	Dec.	-	-	-	-
	Total	559.826	259.849	0.481	0.4642
3Ø	Jan.	-	-	-	-
	Feb.	-	-	-	-
	Mar.	-	-	-	-
	Apr.	2.732	-	0.182	-
	May	1.000	1.610	0.083	1.6100
	June	5.213	0.010	0.386	0.0019
	July	27.882	29.772	0.433	1.0678
	Aug.	-	-	-	-
	Sept.	18.200	0.580	0.911	0.0319
	Oct.	17.919	0.798	0.647	0.0445
	Nov.	-	-	-	-
	Dec.	-	-	-	-
	Total	72.946	32.770	0.478	0.4492

Table 14. (Cont'd.)

NAFO Div.	Month	Observed Am. plaice catch (t)	Observed yellowtail catch (t)	Observed Am. plaice catch rate (t/hr)	Observed yellowtail by-catch rate
3LNØ	Jan.	-	-	-	-
	Feb.	-	-	-	-
	Mar.	287.501	0.016	1.136	0.0001
	Apr.	239.801	14.623	0.417	0.0610
	May	1084.877	71.848	0.609	0.0662
	June	568.874	85.211	0.526	0.1498
	July	607.359	289.218	0.436	0.4762
	Aug.	203.945	-	0.645	-
	Sept.	230.210	23.404	0.983	0.1017
	Oct.	25.090	4.909	0.186	0.1957
	Nov.	-	-	-	-
	Dec.	-	-	-	-
	Total	3247.657	489.229	0.571	0.1506

Table 15. Summary of research stratified random sets by the A. T. CAMERON, 1971-82, NAFO Division 3L, according to by-catch category (as explained in the text).

Unit area	Category 1	2	3	4	5	6	Total no. of sets	Ave. depth of set (m)
N30	2						2	127.0
P30	15						15	139.2
P31	2						2	99.0
Q24	7						7	299.9
Q25	25						25	280.5
Q26	11						11	191.3
Q27	18						18	176.7
Q28	26						26	145.5
Q29	16						16	138.3
Q30	22	9					31	114.3
R24	9						9	315.2
R25	40						40	242.0
R26	37						37	177.9
R27	37						37	157.8
R28	33	1	1				35	132.9
R29	34	5					39	98.1
R30	20	15	6	1			42	84.5
S24	16						16	316.8
S25	46						46	216.3
S26	35						35	165.1
S27	45	2					47	121.0
S28	33	7	4				44	103.8
S29	25	14	1	1	1		42	98.4
S30	6	12	15	4	4		41	80.1
T25	8						8	289.3
T26	27						27	238.3
T27	31	4					35	149.2
T28	18	10			1		29	83.5
T29	2	9	16	7	5		39	72.0
T30		1	6	9	10		26	66.0
U26	3						3	294.0
U27	37						37	231.6
U28	35						35	136.7
U29	15	6	3		1		25	95.4
U30	24	7	4	1			36	89.7
V27	24						24	301.7
V28	35						35	243.1
V29	44						44	213.3
V30	31						31	230.8
Totals	894	102	56	23	22		1097	

Table 16. Summary of research stratified random sets by the A. T. CAMERON, 1971-82, NAFO Division 3N, according to by-catch category (as explained in the text).

Unit area	Category 1	2	3	4	5	6	Total no. of sets	Ave. depth of set (m)
S31		2	11	12	12		37	77.8
S32			6	9	26		41	66.7
S33				2	36	2	40	57.0
S34				1	52	1	54	60.8
S35				7	34		41	63.2
S36	26	3		1	4		34	96.4
S37	27						27	184.2
T31	2	2	7	8	16		35	63.6
T32	5	4	12	5	9		35	68.2
T33	13	4	12	7	24		60	86.1
T34	24	10	3	4	23		64	93.6
T35	49	4	2	2	20		77	158.6
T36	16	3	3	1	2		25	130.5
T37	6						6	216.0
U31	58	5	5	2			70	141.1
U32	26						26	188.5
U33	1						1	287.0
U34	5						5	225.4
V31	10						10	227.3
Totals	268	37	61	61	258	3	688	

Table 17. Summary of research stratified random sets by the A. T. CAMERON, 1971-82, NAFO Division 30, according to by-catch category (as explained in the text).

Unit area	Category 1	2	3	4	5	6	Total no. of sets	Ave. depth of set (m)
N31	10	1					11	113.4
N32	11	2	1				14	103.9
N33	10	3	2				15	162.0
P31	19	8		1			28	97.1
P32	13	4	9	2			28	78.1
P33	20	8	11	2	4		45	111.4
P34	12						12	214.2
Q31	13	6	6	2	1		28	88.0
Q32	14	11	1		2		28	93.6
Q33	7	7	8	5	9		36	80.9
Q34	33	2	2	3	3		43	157.8
Q35	26	2					28	207.1
R31		7	8	7	13	1	36	80.1
R32		2	2	7	16		27	71.2
R33	1		3	4	25		33	70.5
R34			3	1	20		24	72.3
R35	15	5	8	2	7		37	91.8
R36	43	1	2				46	197.1
Totals	247	69	66	36	100	1	519	

Table 18. Average depth (m) of the research stratified random sets by the A. T. CAMERON, 1971-82, NAFO Divisions 3L, 3N, 30, according to by-catch category (as explained in the text).

NAFO Division		1	2	3	4	5	6
3L	No. sets	894	102	56	23	22	-
	Ave. depth	177.4	87.7	75.6	70.3	71.2	-
3N	No. sets	268	37	61	61	258	3
	Ave. depth	172.5	67.5	73.1	65.3	60.8	55.0
30	No. sets	247	69	66	36	100	1
	Ave. depth	152.8	90.2	82.4	77.8	72.7	80.0
3LNO	No. sets	1409	208	183	120	380	4
	Ave. depth	172.1	84.9	77.2	70.0	64.5	61.3

Table 19. Breakdown of research stratified sets, by year, A. T. CAMERON, 1971-82, for unit area group "NP". By-catch categories are as explained in the text.

Year	Category 1	2	3	4	5	6	Total	Average depth (m)
1971							-	-
1972							-	-
1973	7	1		1	1		10	88.7
1974							-	-
1975	2	2	3				7	90.7
1976	3	3	3				9	93.7
1977	6	1			2		9	98.4
1978	15	6	6	2	1		30	109.6
1979	6	5	5	2			18	117.4
1980	6	1	1				8	108.8
1981	19	1					20	114.2
1982	11	5	5				21	104.5

Table 20. Breakdown of research stratified sets, by year, A. T. CAMERON, 1971-82, for unit area group "Q". By-catch categories are as explained in the text.

Year	Category 1	2	3	4	5	6	Total	Average depth (m)
1971							-	-
1972		1					1	75.0
1973	8	3	1	1	1		14	126.9
1974							-	-
1975	5	2	1	2			10	105.6
1976	5	5	1		1		12	90.9
1977	4	2	2	3	2		13	109.0
1978	9	10	3	1	4		27	98.8
1979	15	5	4	1	6		31	115.8
1980	13	1	2	1	1		18	120.5
1981	15			1			16	111.8
1982	15	6	3				24	107.4

Table 21. Breakdown of research stratified sets, by year, A. T. CAMERON, 1971-82, for unit area group "R". By-catch categories are as explained in the text.

Year	Category 1	2	3	4	5	6	Total	Average depth (m)
1971	5	3	1	1			10	107.1
1972	5	4	1		1		11	99.8
1973	11	2	2	1	5	1	22	99.2
1974	6	1					7	116.1
1975	7		5	4	2		18	98.1
1976	11	3	4	2	3		23	117.0
1977	7	2	3	3	10		25	90.2
1978	10	2	4	3	15		34	87.7
1979	20	3	2	3	22		50	105.5
1980	20	7	2	3	15		47	101.4
1981	29	4	3		1		37	134.9
1982	15	5	6	2	7		35	98.9

Table 22. Breakdown of research stratified sets, by year, A. T. CAMERON, 1971-82, for unit area group "S". By-catch categories are as explained in the text.

Year	Category 1	2	3	4	5	6	Total	Average depth (m)
1971	9	5	6		7		27	89.0
1972	2	3	3	5	16	1	30	73.5
1973	6		4	2	6		18	77.8
1974	5	1		3	6		15	80.2
1975	2	2	1	2	9		16	68.4
1976	19	5	1	4	13		42	86.2
1977	6	3	3	2	11		25	83.1
1978	5	5		4	18		32	72.3
1979	11	5	5	5	22		48	78.8
1980	4	5	3	4	23		39	70.4
1981	14	3	9	4	20	2	52	75.8
1982	7	1	2	2	18		30	74.7

Table 23. Breakdown of research stratified sets, by year, A. T. CAMERON, 1971-82, for unit area group "T". By-catch categories are as explained in the text.

Year	Category 1	2	3	4	5	6	Total	Average depth (m)
1971	5	3	3		10		21	85.2
1972	10	1	7	4	16		38	84.0
1973	10		4	3	5		22	110.1
1974	7	4	1		7		19	94.4
1975	5	1	1		6		13	86.9
1976	1	1	1	2	3		8	62.6
1977	7	6	4	4	7		28	99.8
1978	13	11	8	6	15		53	84.1
1979	15	6	8	8	8		45	110.6
1980	11	3	6	7	10		37	106.2
1981	35	5	14	4	9		67	113.7
1982	10	6	4	5	14		39	91.9

Table 24. Breakdown of research stratified sets, by year, A. T. CAMERON, 1971-82, for unit area group "U". By-catch categories are as explained in the text.

Year	Category 1	2	3	4	5	6	Total	Average depth (m)
1971	4	2	1	1	1		9	103.6
1972	6	2	1				9	109.8
1973	7	1	1	1			10	122.7
1974	10	1					11	121.3
1975	1						1	97.0
1976	3						3	146.3
1977	3	2	2				7	111.9
1978	11	1					12	125.3
1979	11	2	1				14	113.6
1980	11	2					13	124.7
1981	21	3	3				27	119.2
1982	2	2	3	1			8	88.3

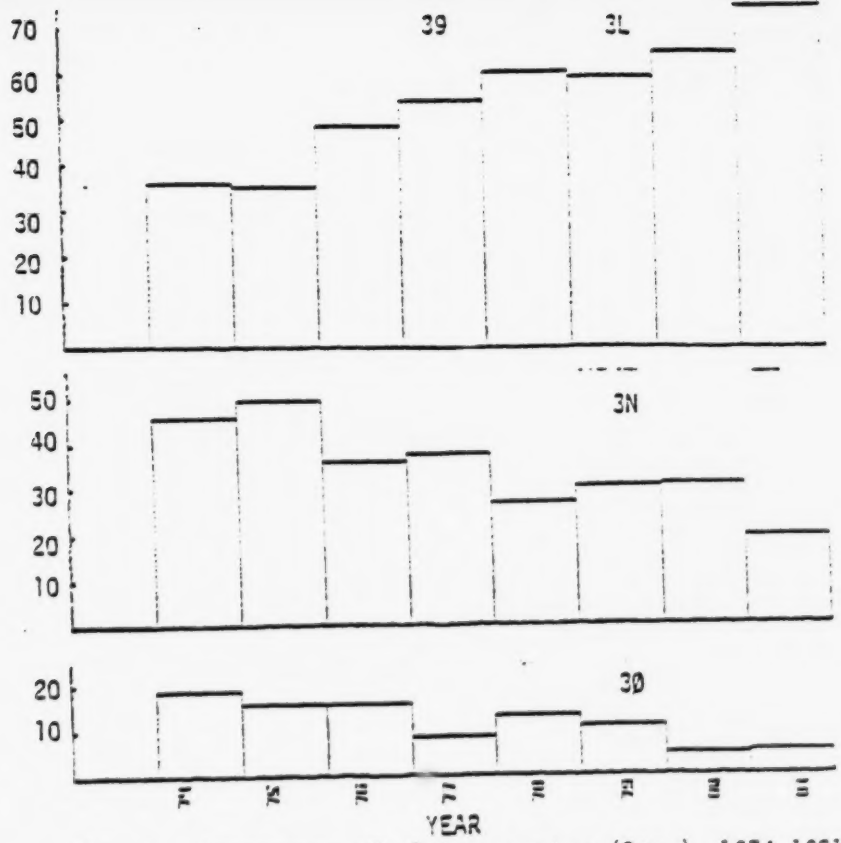

Fig. 1. Percentage of plaice catches (Can.), 1974-1981, by Division, for Divisions 3LNØ.

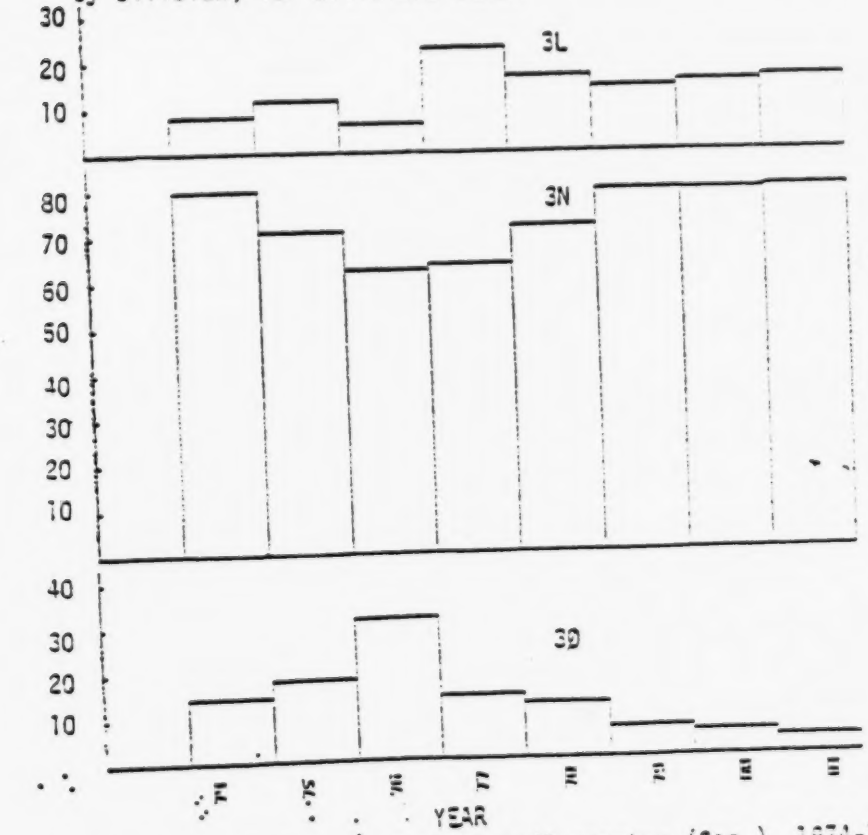

Fig. 2. Percentage of yellowtail catches (Can.), 1974-1981, by Division, for Divisions 3LNØ.

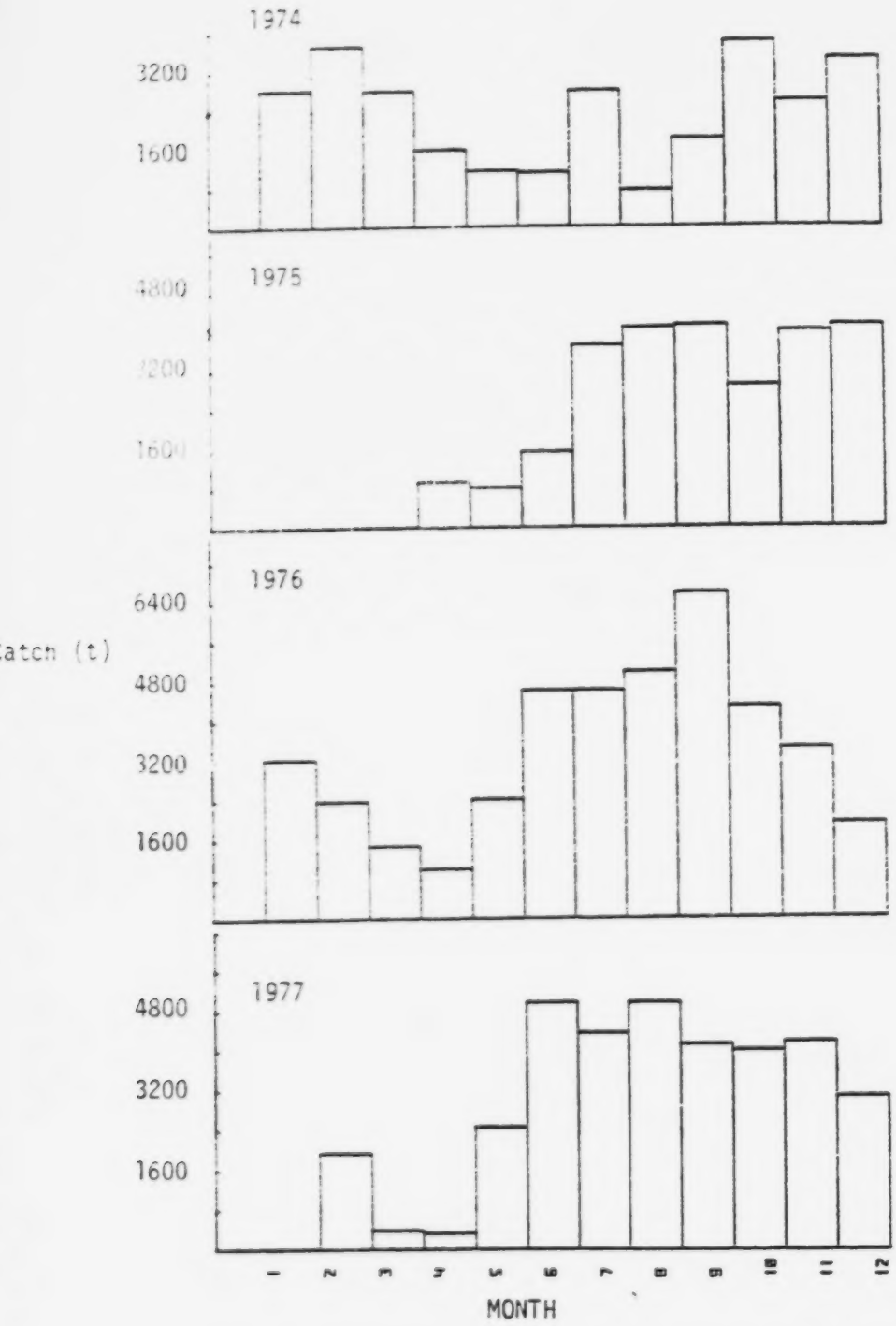

Fig. 3. Catches of American plaice in the main species plaice fishery (Can.), by month, 1974-77, in NAFO Divisions 3LNØ.

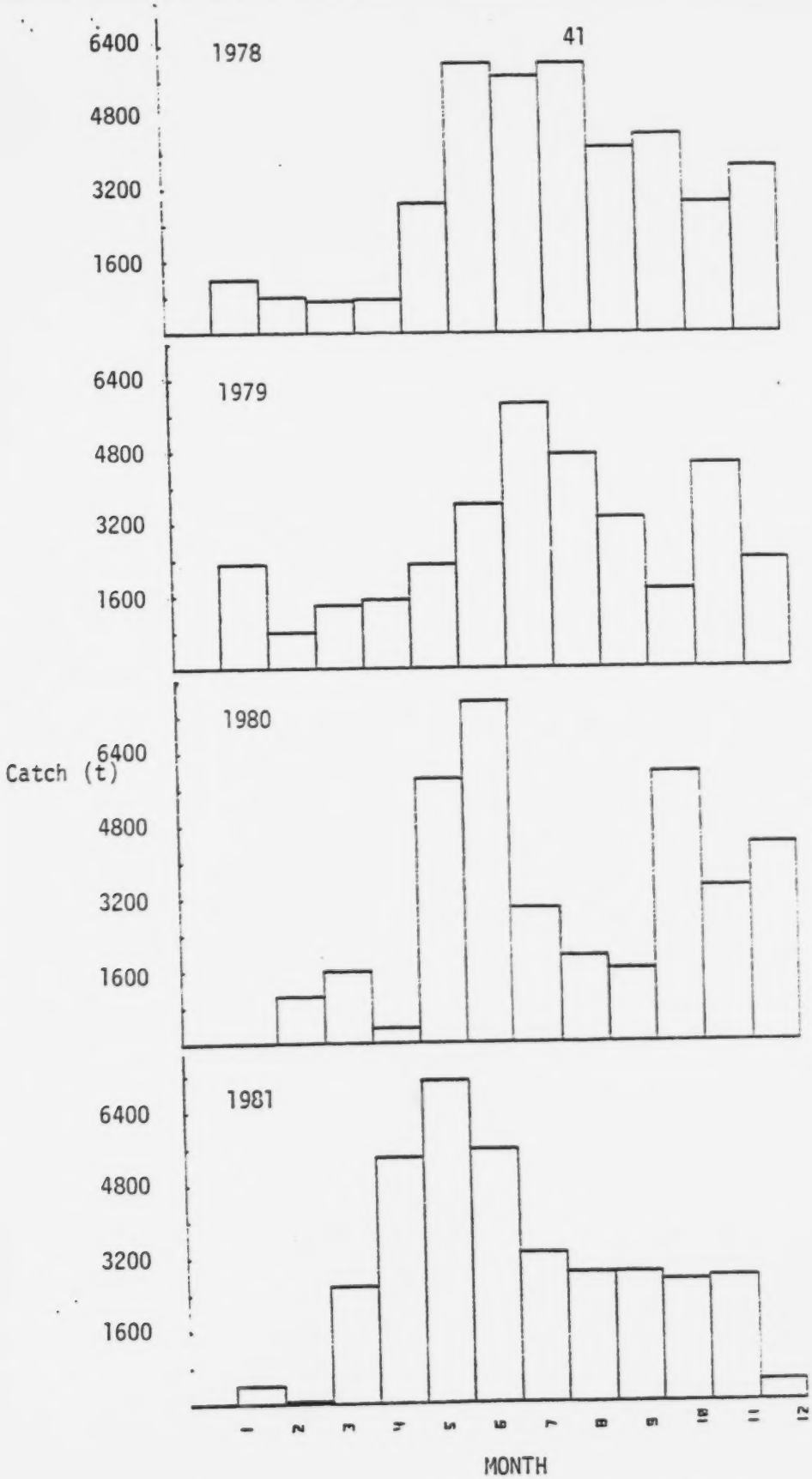

Fig. 4. Catches of American plaice in the main species plaice fishery (Can.), by month, 1978-81, in NAFO Divisions 3LNO.

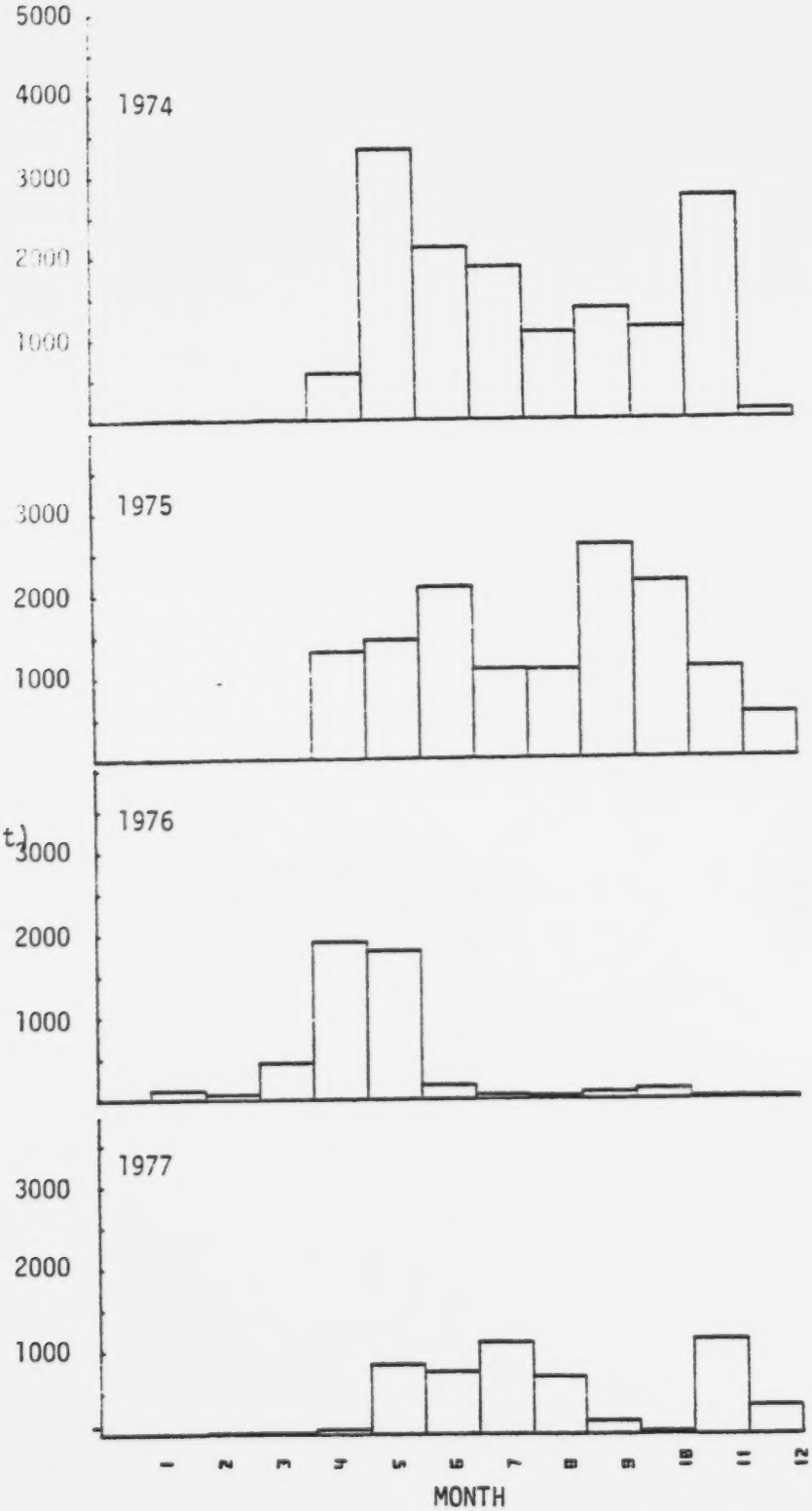

Fig. 5. Catches of yellowtail in the main species yellowtail fishery (Can.), by month, 1974-77, in NAFO Divisions 3LNØ.

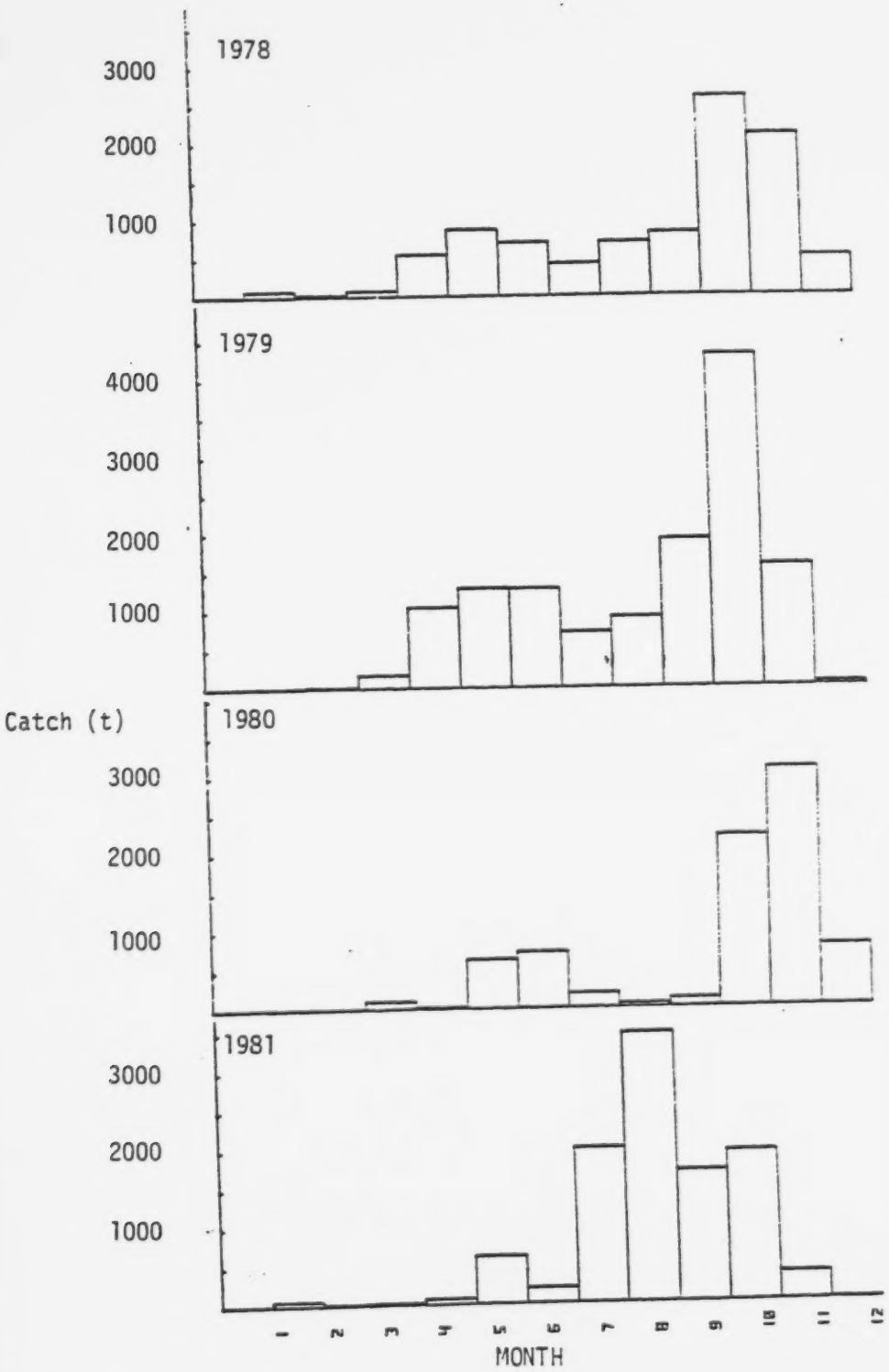

FIg. 6. Catches of yellowtail in the main species yellowtail fishery (Can.), by month, 1978-81, in NAFO Divisions 3LNØ.

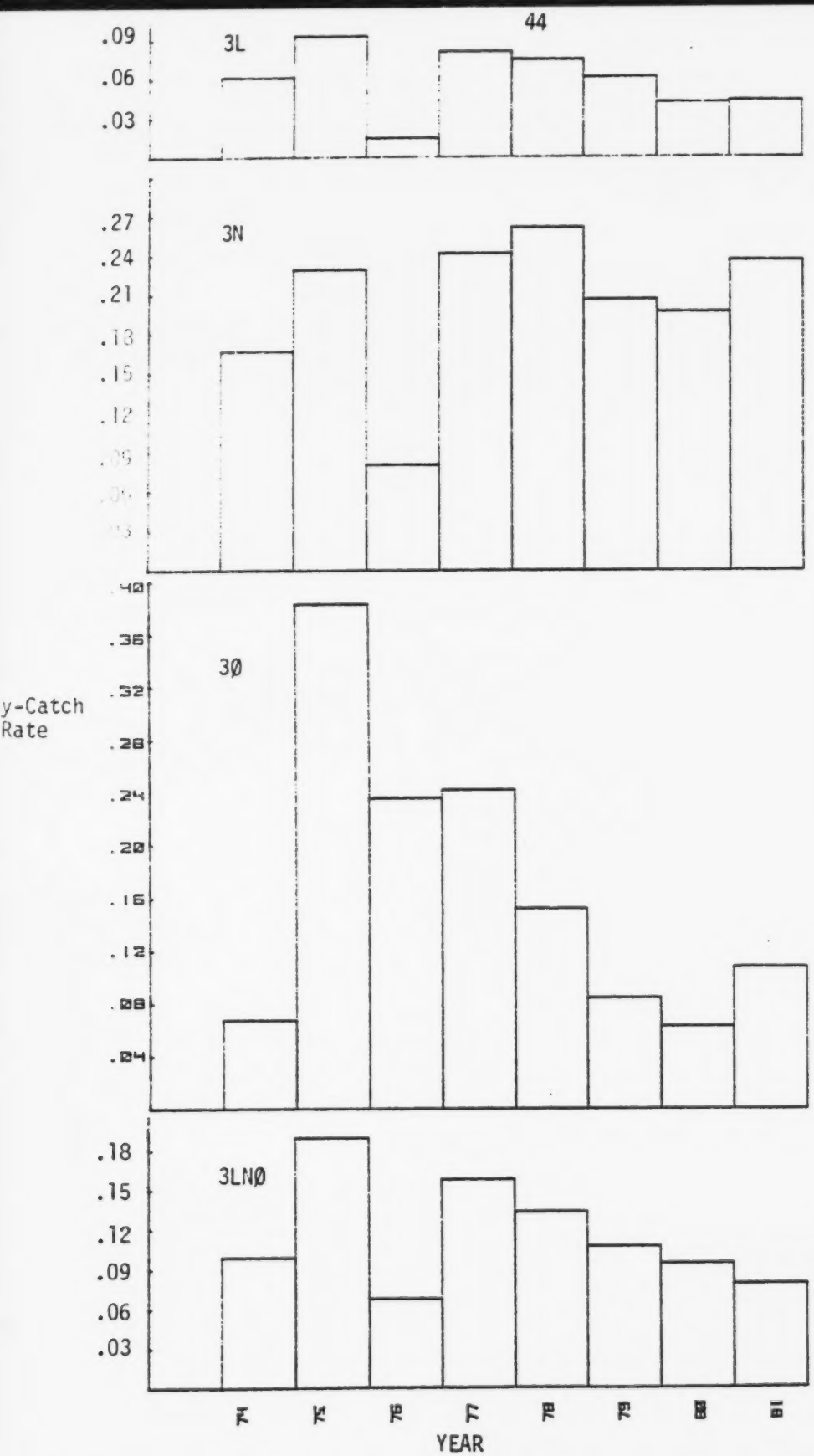

Fig. 7. By-catch rates of yellowtail in the main species plaice fishery (Can.), 1974-81, in NAFO Divisions 3LNØ.

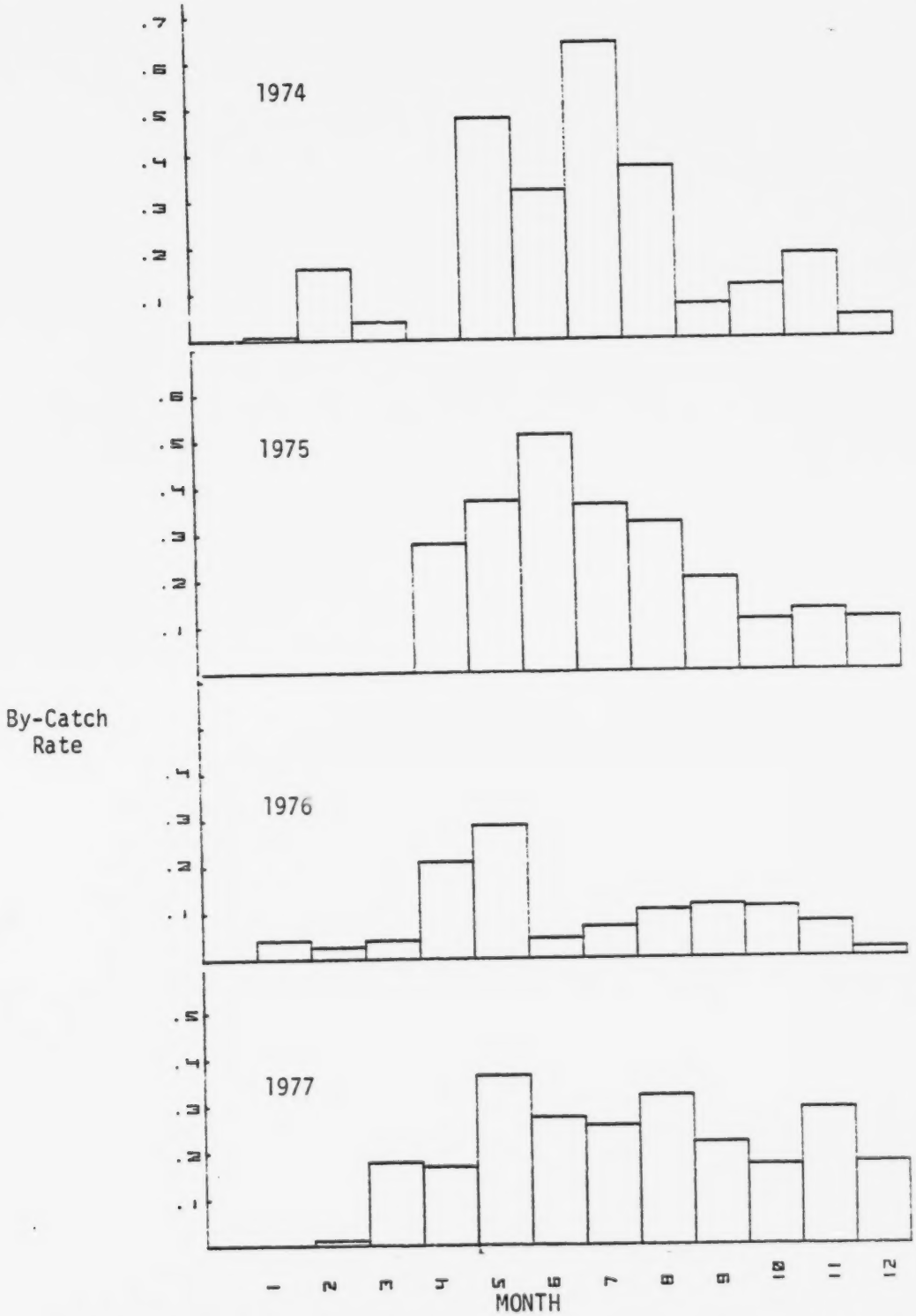

Fig. 8. By-catch rates of yellowtail in the main species plaice fishery (Can.), by month, 1974-77, in NAFO Division 3N.

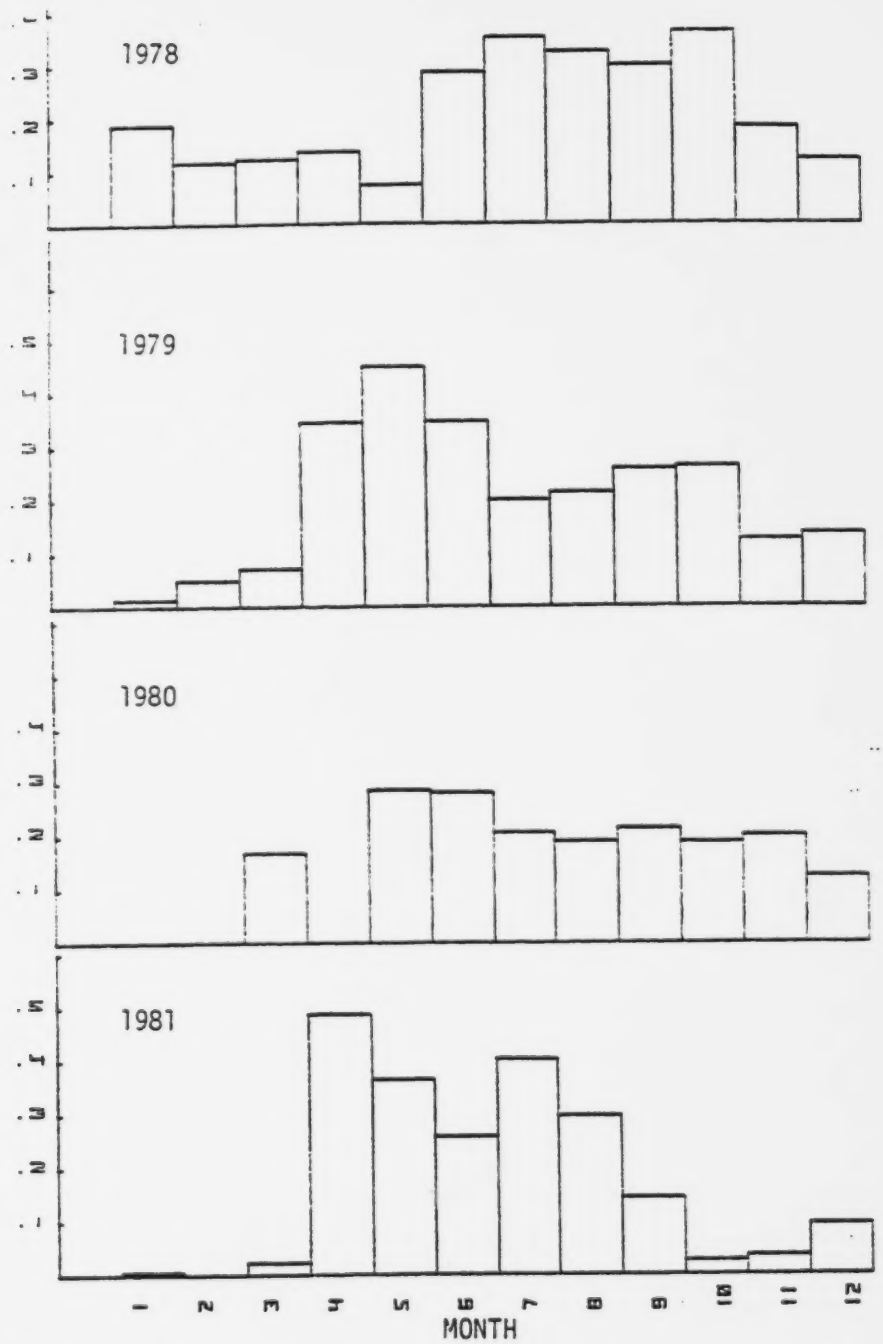

Fig. 9. By-catch rates of yellowtail in the main species plaice fishery (Can.), by month, 1978-81, in NAFO Division 3N.

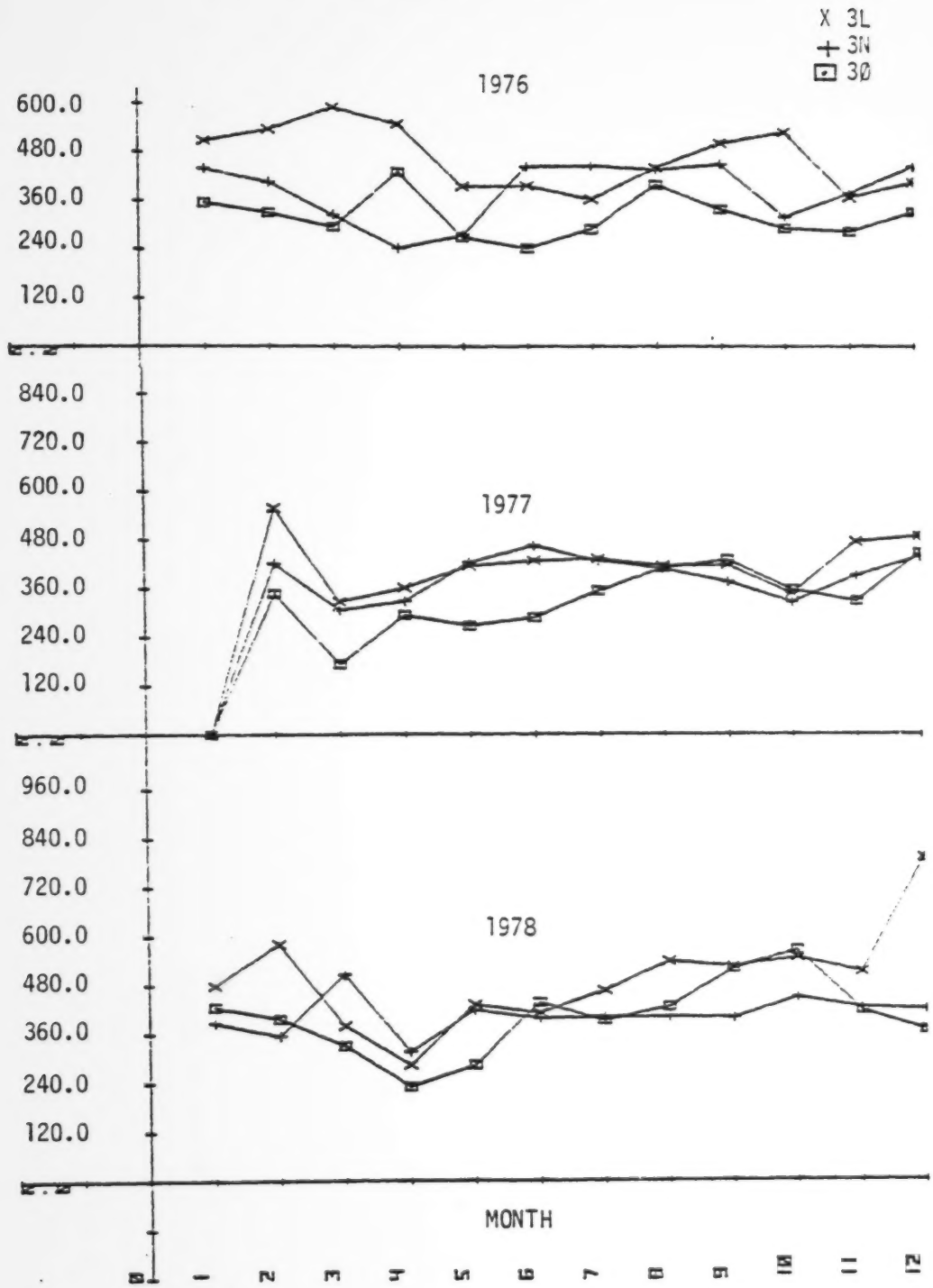

Fig. 10. CPUE for plaice in the main species fishery (Can-N), by month, 1976-78, in NAFO Divisions 3LNØ.

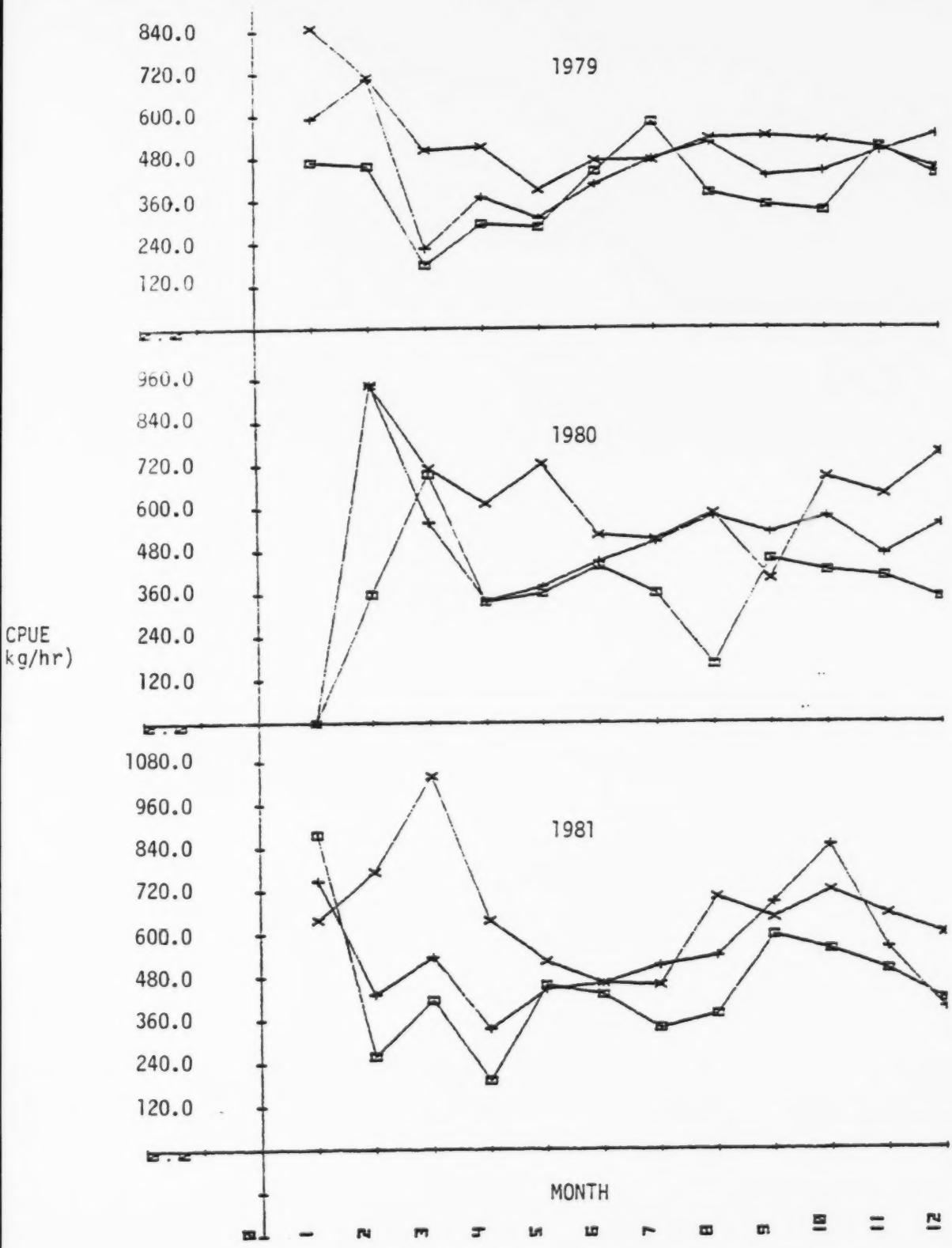

Fig. 11. CPUE for plaice in the main species plaice fishery (Can-N), by month, 1979-81, in NAFO Divisions 3LNØ.

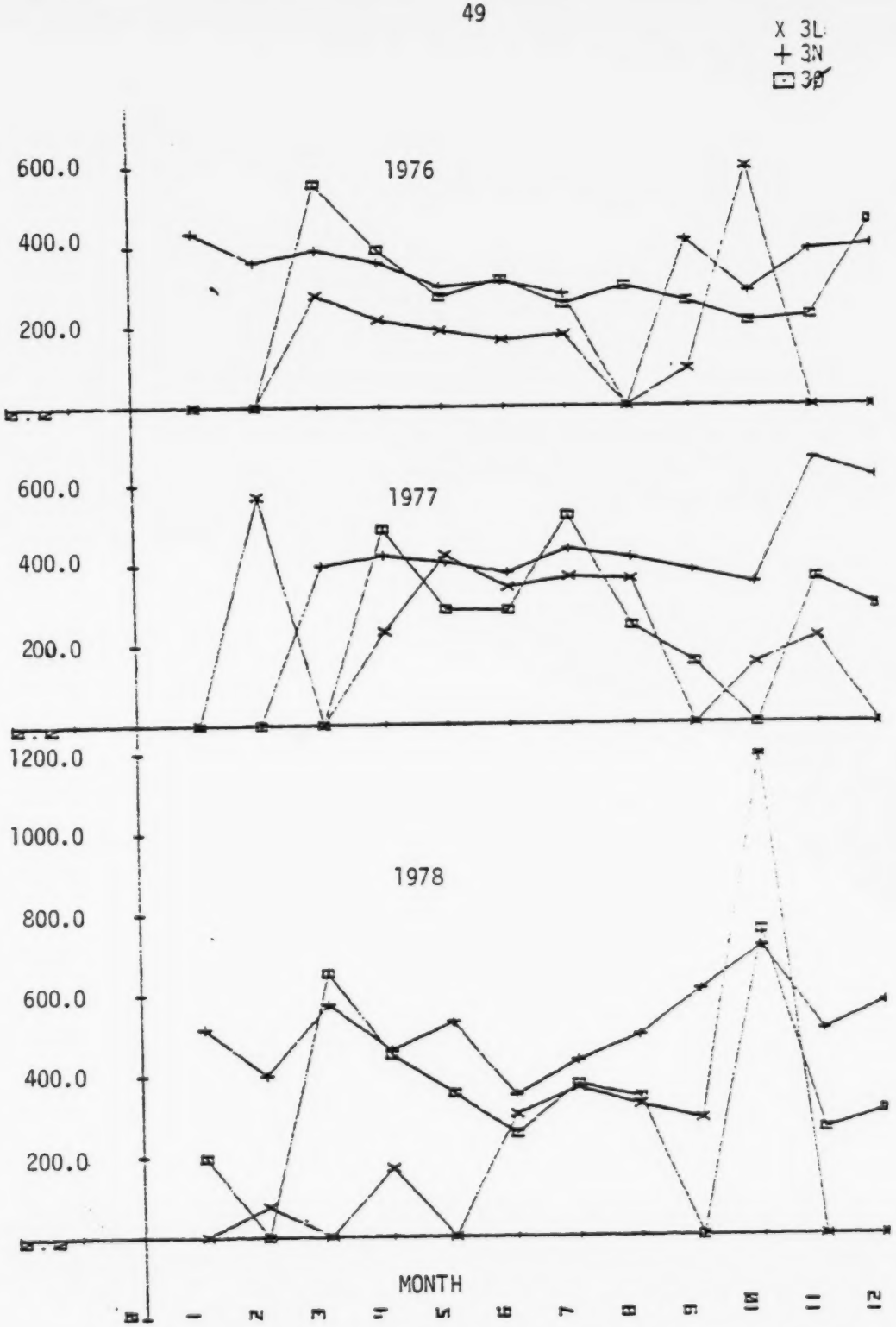

Fig. 12. CPUE for yellowtail in the main species yellowtail fishery (Can.-N), by month, 1976-78, in NAFO Divisions 3LNØ.

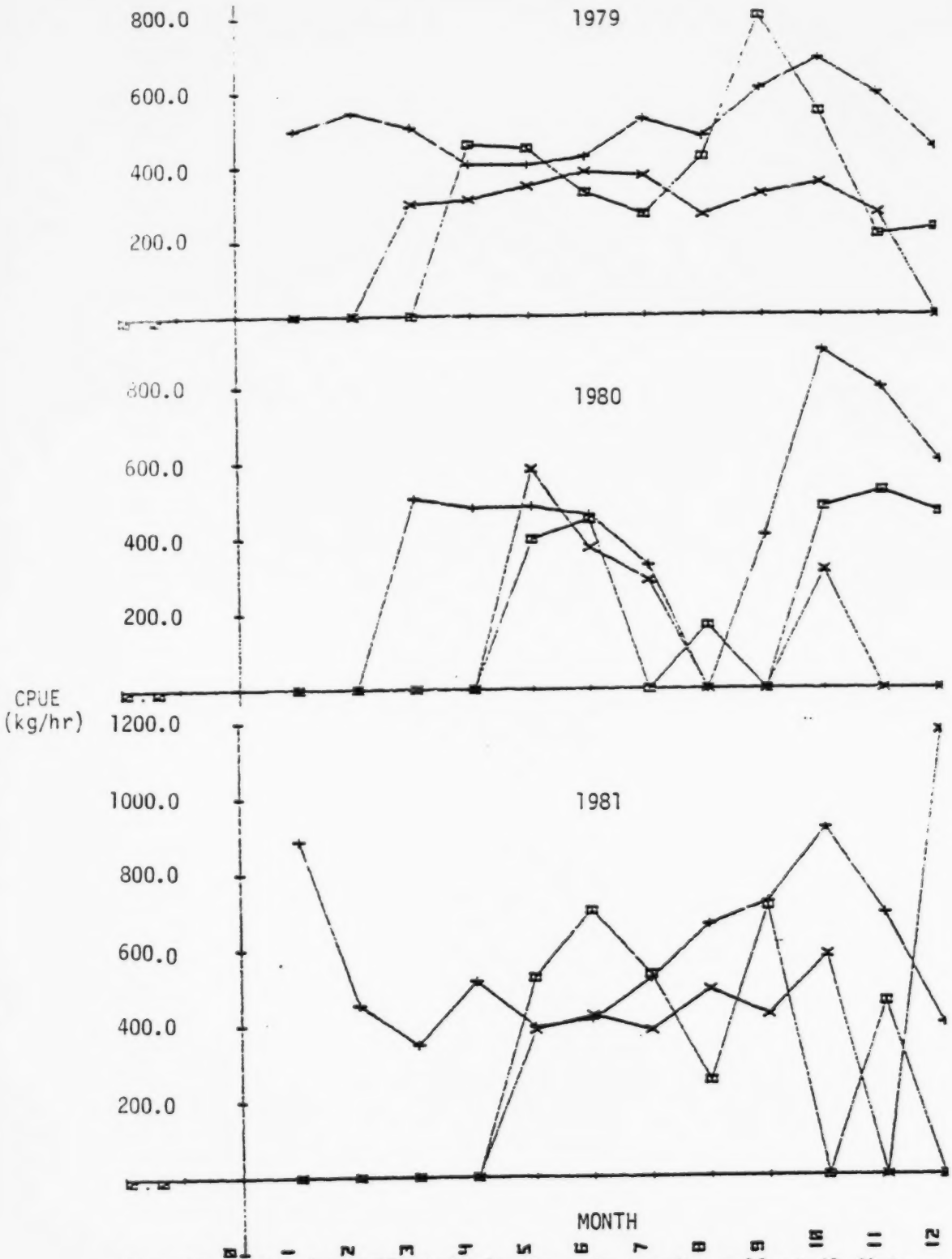

Fig. 13. CPUE for yellowtail in the main species yellowtail fishery (Can.-N), by month, 1979-81, in NAFO Divisions 3LNØ.

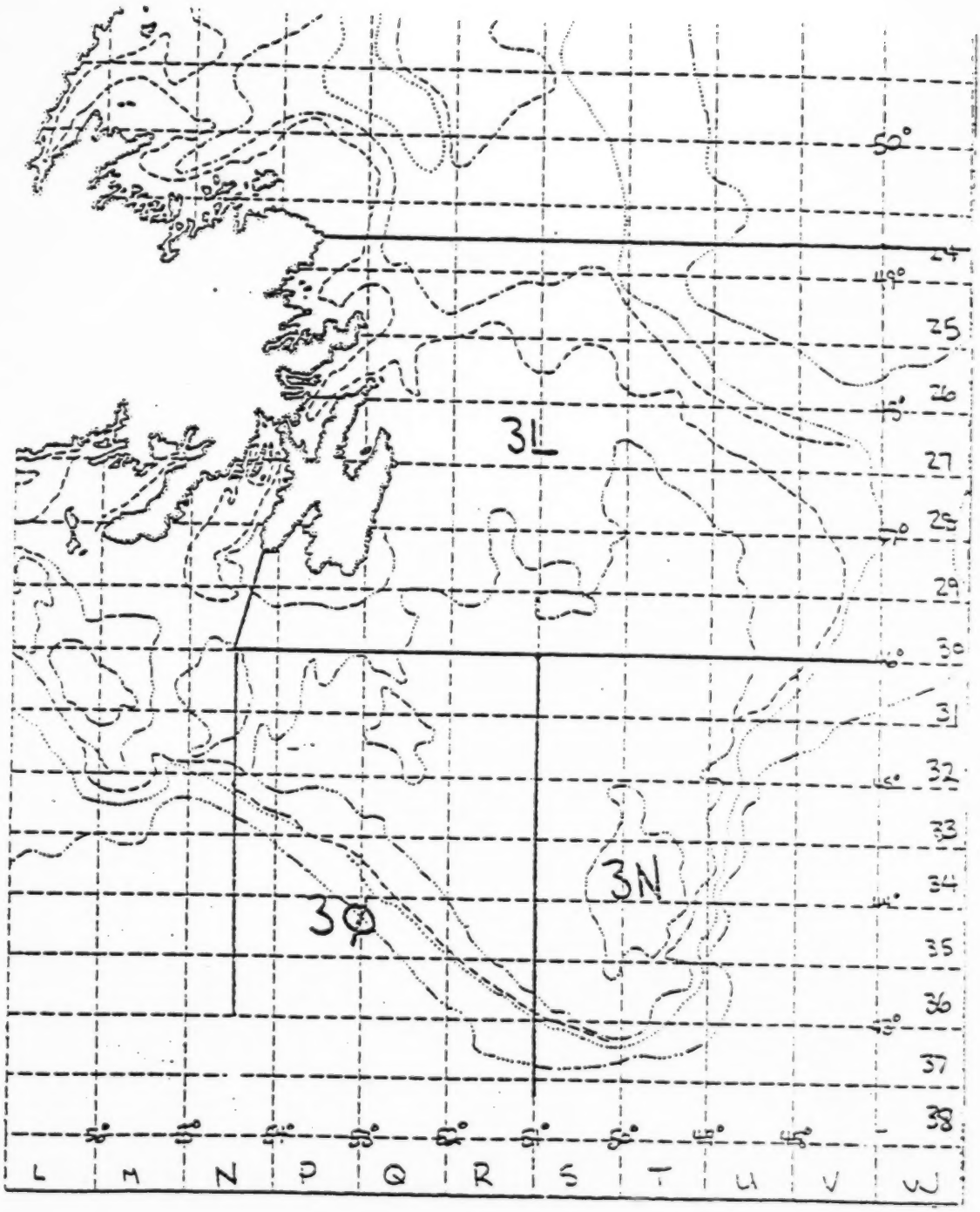

Fig. 14. Unit areas, NAFO Divisions 3LNØ.

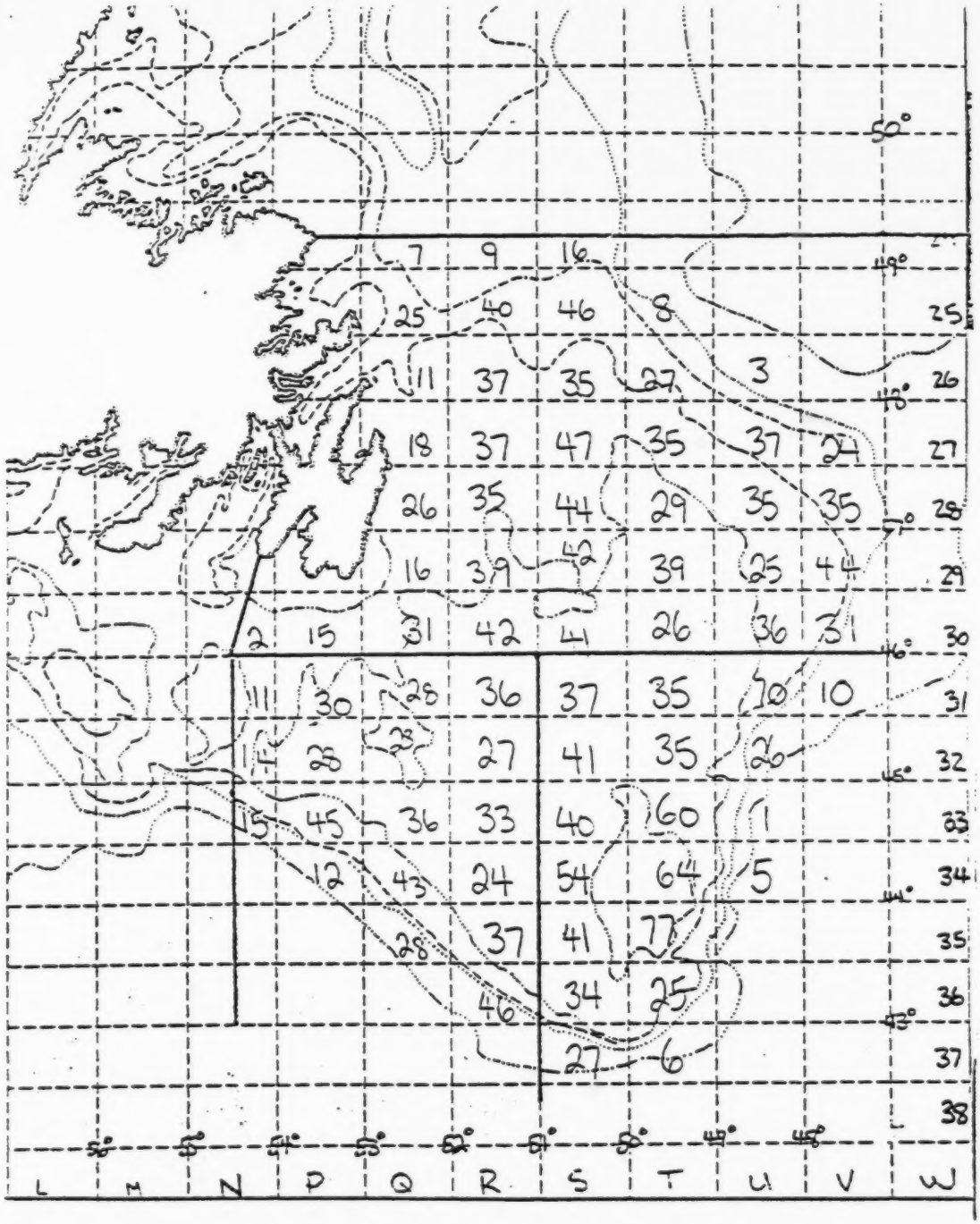

Fig. 15. Number of random stratified sets by the research vessel A. T. Cameron, by unit area, 1971-82, categorized on the basis of plaice and yellowtail catches.

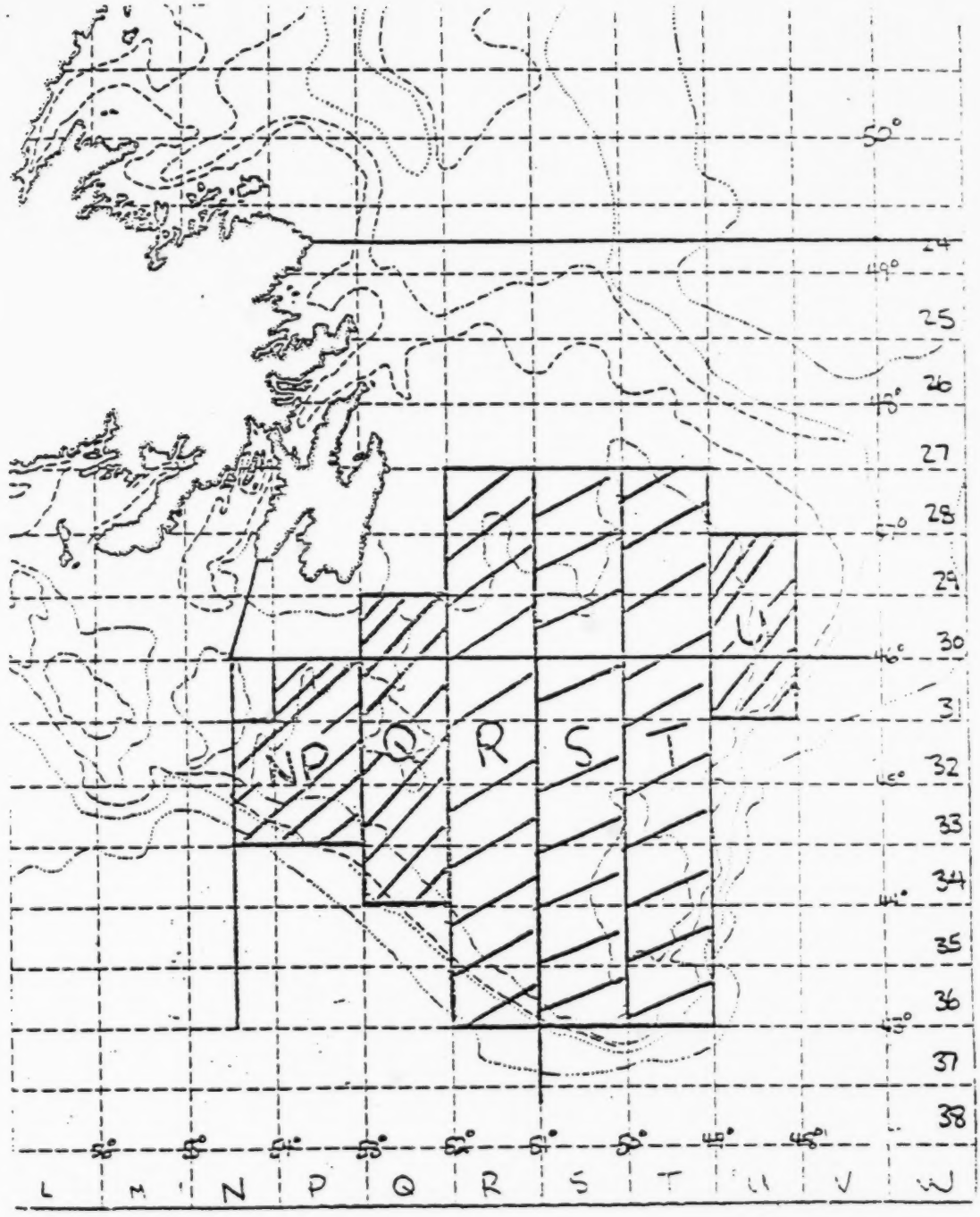

Fig. 16. Combination of selected unit areas into 6 groups.

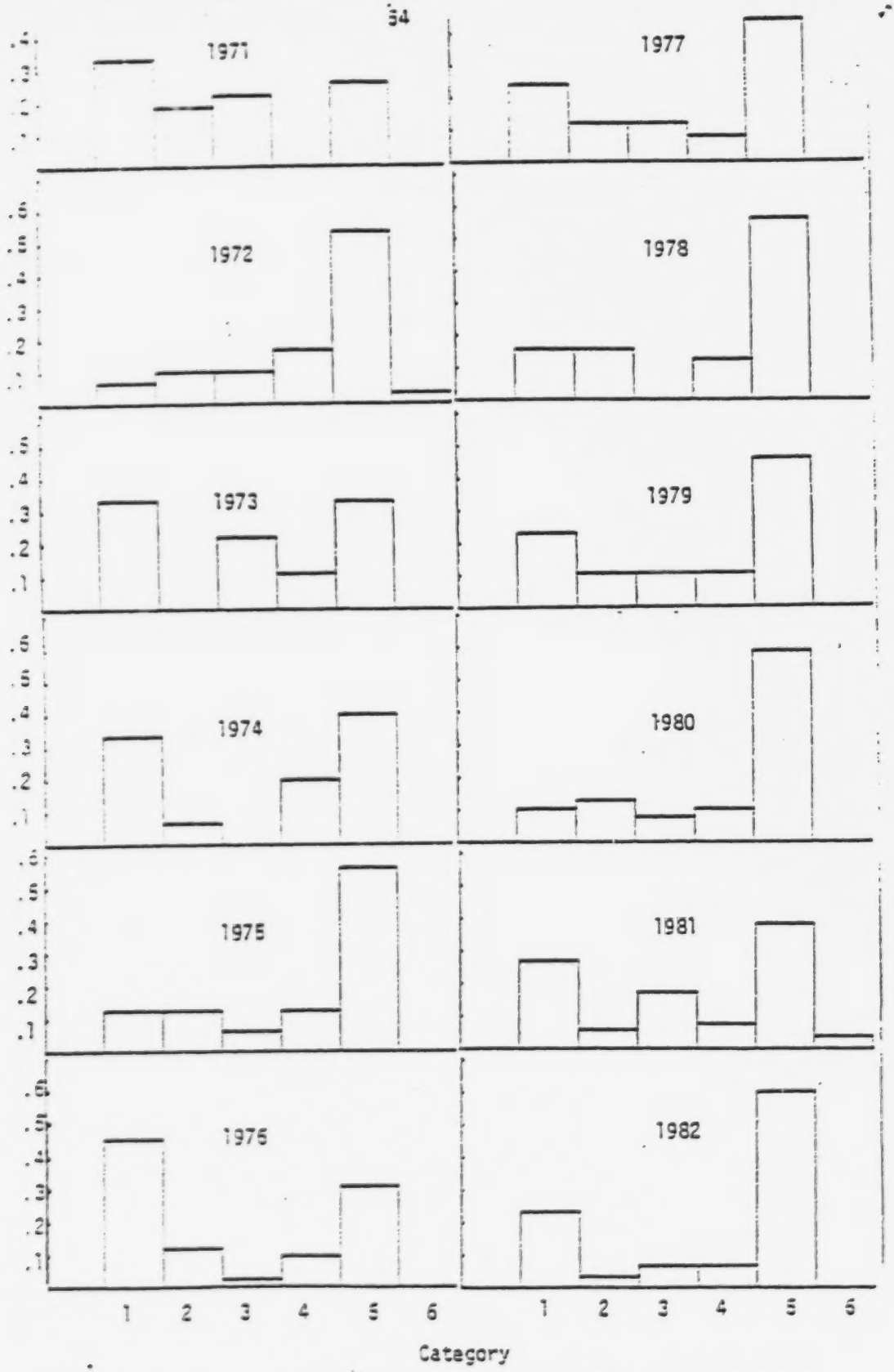

Fig. 17. Percentage of sets in by-catch categories. Sets used are from random stratified surveys by the A. T. Cameron, 1971-82, Area 5. By-catch categories are explained in the text.